UNIVERSITY OF WINCHESTER

Investigating the Influence of Alcohol on Eyewitness Memory

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Doctor of Philosophy

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Abstract:

Whilst many eyewitness factors have been researched, one issue that has been largely overlooked until very recently is witness intoxication. Police officers in study 1 of this thesis, however, indicated that intoxicated witnesses are a common occurrence. With so little research there are no specific guidelines for the Criminal Justice System detailing the capabilities of intoxicated witnesses. To understand the abilities of these individuals, this thesis tested the theory currently underpinning intoxicated witness research: Alcohol Myopia Theory (AMT). This theory considers alcohol to particularly impair the recall of low, as opposed to high, salience details. Within this thesis, in contrast to previous research, but consistent with AMT, salience was determined by spatial location and semantic meaning, as opposed to information type or centrality. At low (MBAC=.06%) to moderate (MBAC=.09%) levels of intoxication, recall was not impaired when memory was assessed through free recall or a true/false recognition test. At higher intoxication levels (MBAC=.14%; study 3; a field study), contrary to the propositions of AMT, alcohol was only seen to impair free recall completeness, with high rather than low salience details suffering the greater deficit. In seeking to improve the recall of highly intoxicated witnesses, study 4 (a field study) adopted a modified Enhanced Cognitive Interview (ECI) procedure, applying the report everything and mental reinstatement of context mnemonics. The ECI, improved the correct recall, accuracy and completeness of moderately (MBAC=.05%) and severely intoxicated (MBAC=.14%) witnesses. With this thesis indicating that low to moderate intoxication levels are not particularly detrimental to recall, study 5 looked at juror perceptions of intoxicated witness credibility. The knowledge that the witness was intoxicated, rather than the actual testimony, resulted in poorer credibility ratings. In light of this thesis' findings it is argued that AMT does not account for alcohols effect on eyewitness recall, but high levels of intoxication impair recall completeness but not accuracy. Based on this thesis it is recommended that police officers are provided with clear guidelines on how to deal with intoxicated witnesses, including interviewing with the ECI, even in the modified form. In addition, it is recommended that all parties in the judicial process be educated on the limited effect moderate intoxication has on witness recall, and that severe intoxication impairs recall completeness but not accuracy.

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DISSEMINATION OF FINDINGS

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Journal articles

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ABSTRACT

Investigating the Influence of Alcohol on Eyewitness Memory

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Whilst many eyewitness factors have been researched, one issue that has been largely overlooked until very recently is witness intoxication. Police officers in study 1 of this thesis, however, indicated that intoxicated witnesses are a common occurrence. With so little research there are no specific guidelines for the Criminal Justice System detailing the capabilities of intoxicated witnesses. To understand the abilities of these individuals, this thesis tested the theory currently underpinning intoxicated witness research: Alcohol Myopia Theory (AMT). This theory considers alcohol to particularly impair the recall of low, as opposed to high, salience details. Within this thesis, in contrast to previous research, but consistent with AMT, salience was determined by spatial location and semantic meaning, as opposed to information type or centrality. At low (M_{BAC}=.06%) to moderate (M_{BAC}=.09%) levels of intoxication, recall was not impaired when memory was assessed through free recall or a true/false recognition test. At higher intoxication levels (M_{BAC}=.14%; study 3; a field study), contrary to the propositions of AMT, alcohol was only seen to impair free recall completeness, with high rather than low salience details suffering the greater deficit. In seeking to improve the recall of highly intoxicated witnesses, study 4 (a field study) adopted a modified Enhanced Cognitive Interview (ECI) procedure, applying the report everything and mental reinstatement of context mnemonics. The ECI, improved the correct recall, accuracy and completeness of moderately (M_{BAC}=.05%) and severely intoxicated (M_{BAC}=.14%) witnesses. With this thesis indicating that low to moderate intoxication levels are not particularly detrimental to recall, study 5 looked at juror perceptions of intoxicated witness credibility. The knowledge that the witness was intoxicated, rather than the actual testimony, resulted in poorer credibility ratings. In light of this thesis' findings it is argued that AMT does not account for alcohols effect on eyewitness recall, but high levels of intoxication impair recall completeness but not accuracy. Based on this thesis it is recommended that police officers are provided with clear guidelines on how to deal with intoxicated witnesses, including interviewing with the ECI, even in the modified form. In addition, it is recommended that all parties in the judicial process be educated on the limited effect moderate intoxication has on witness recall, and that severe intoxication impairs recall completeness but not accuracy.

Keywords: Alcohol Intoxication, Eyewitness Recall, Alcohol Myopia Theory, Enhanced Cognitive Interview, Juror Perception.

LIST OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Page Number

Chapter 1: Literature Review

1.1. The Problem of Intoxicated Eyewitnesses

Eyewitnesses usually provide the major leads in criminal investigations (Coupe & Griffiths, 1996; Kebbell & Milne, 1998; Wells & Loftus, 2003), with their testimony being one of the most persuasive and useful pieces of evidence presented to jurors (Boyce, Beaudry, & Lindsay, 2007; Brewer & Burke, 2002; Lindsay, 1994). Studies have shown, however, that such testimony is prone to errors (Sporer, Penrod, Read, & Cutler, 1995) and is the most common cause of wrongful convictions (Boyce et al., 2007; Gross & Shaffer, 2012). Determining the accuracy of such evidence is therefore crucial in preventing miscarriages of justice. Whilst to date many factors affecting eyewitness testimony have been researched, e.g., stress (Deffenbacher, Bornstein, Penrod, & McGorty, 2004), misinformation (Huff, Weinsheimer, & Bodner, 2016) and age (Marche, Briere, Cordwell, & Holliday, 2014), one issue that has until very recently been largely overlooked is witness intoxication and how this may affect eyewitness testimony.

1.1.1. The scope of the problem.

In the UK around 28.9 million adults or 58% of the population now consume at least 1 unit of alcohol a week (Office of National Statistics (ONS), 2015e). Of these individuals, around one in every two men (52%) and one in three women (37%) are estimated to exceed the recommended weekly guide of 14 units of alcohol over three days, or 4.67 units in one day (ONS, 2015d). Research also indicates that within England and Wales, alcohol is considered to be a factor in around half of all violent crimes (Budd, Sharp, & Mayhew, 2005; Dingwall, 2013; Maguire, Nettleton, Rix, & Raybould, 2003; Richardson & Budd, 2003). In fact, in 2014/15 an estimated 22% of robberies (ONS, 2015c) and 47% of violent crimes committed in England and Wales were alcohol-related (ONS, 2015b). Further to this around three in five individuals arrested by the police test positive for alcohol (Deehan, Marshall, & Saville, 2002). These levels have remained steady over recent years (ONS, 2015b) despite a fall in alcohol consumption of around 18% from 2005 to 2013 (ONS, 2013). Regarding the intoxication of victims, research also indicates that consuming alcohol increases the probability of being targeted by criminals (Touhig, 1998).

Statistics in relation to the extent of witness intoxication, however, are limited, especially for instances where the witness is not also the victim (Evans, Schreiber Compo, & Russano, 2009; Palmer, Flowe, Takarangi, & Humphries, 2013). In the United States, research indicates that around 41% of all witnesses interviewed by police are intoxicated at the time they witnessed the crime (Evans et al., 2009). In addition, approximately 73% of American

police officers and other law officials, considered it a common occurrence to have to deal with intoxicated witnesses (Evans et al., 2009), with each investigator dealing with approximately 17 such individuals a month. In terms of those eyewitnesses whose testimony is heard in court, around a third of these individuals are considered to be under the influence of alcohol (or some other form of drug) at the time of the crime (Palmer et al., 2013). No such data, however, is available for the UK population. Nevertheless, the UK and North America have comparable levels of alcohol consumption (World Health Organisation (WHO), 2014), and similar frequencies of alcohol fuelled crimes (Dorsey & Middleton, 2010; Greenfield & Weisner, 1995; Yarvis, 1994). It therefore appears reasonable (until relevant research is conducted) to suggest that the proportion of intoxicated witnesses in the UK is likely to be comparable to that in North America.

1.1.2. The need for further research.

Despite the role alcohol plays in criminal offences, and over half the UK population consuming at least one unit of alcohol a week (ONS, 2015e), this field is still a widely under-investigated area (Malpass et al., 2008). In fact, in the UK, to date only two published studies have looked at the recall of intoxicated eyewitnesses. Within this research, recall of a sexual assault (Flowe, Takarangi, Humphries, & Wright, 2016) and the effect of repeated interviewing (La Rooy, Nicol, & Terry, 2013) have been investigated. Additionally, studies 2a, 2b and 3 of this thesis have also been published (Crossland, Kneller, & Wilcock, 2016b) and study 4 has been submitted for publication (Crossland, Kneller, & Wilcock, 2016a). Further to this within the present body of international published literature, there are only a total of eight studies that have looked at the recall abilities of intoxicated witnesses using forensically relevant stimuli (Flowe et al., 2016; Hagsand, Roos af Hjelmsäter, Granhag, Fahlke, & Söderpalm-Gordh, 2013a; Hagsand, Roos af Hjelmsäter, Granhag, Fahlke, & Söderpalm-Gordh, 2016; Hildebrand Karlén, Roos af Hjelmsäter, Fahlke, Granhag, & Söderpalm-Gordh, 2015; La Rooy et al., 2013; Schreiber Compo et al., 2011; Schreiber Compo et al., 2012; Yuille & Tollestrup, 1990). However, other research has looked at intoxicated witnesses' recall of a static image (Harvey, Kneller, & Campbell, 2013a, 2013b), the identification accuracy of intoxicated witnesses (Dysart, Lindsay, MacDonald, & Wicke, 2002; Hagsand, Roos Af Hjelmsäter, Granhag, Fahlke, & Söderpalm-Gordh, 2013b; Kneller & Harvey, 2016), cross-race face learning (Harvey, 2014), the effect of an intoxicated co-witness (Zajac, Dickson, Munn, & O'Neill, 2013) and the recall of an intoxicated perpetrator (Read, Yuille, & Tollestrup, 1992; Van Oorsouw & Merckelbach, 2012; Van Oorsouw, Merckelbach, & Smeets, 2015).

Whilst this shortage of studies highlights a lack of empirical understanding in the UK regarding the abilities of intoxicated witnesses, there is an extensive volume of research on

the more general memory deficits resulting from alcohol (see Maylor & Rabbitt, 1993). It is this data that expert witnesses readily draw upon when informing courts of the issues regarding the likely effects of alcohol intoxication on the testimony of witnesses and victims (Kassin, Tubb, Hosch, & Memon, 2001). In conjunction with this, jurors also bring their own perceptions of alcohol's effect on memory to the court room, and subsequently their verdict (Benton, Ross, Bradshaw, Thomas, & Bradshaw, 2006; Evans & Schreiber Compo, 2010; Lindsay, 1994; Schuller & Wall, 1998). For example, a study of potential jurors in the USA found 96% considered alcohol to impair eyewitness memory (Benton et al., 2006). Lindsay (1994), however, found that the verdict of mock jurors was not affected by a witness's higher level of intoxication, unless this was accompanied by low confidence, in which case a 'not guilty' verdict was more likely.

Presently there is no specific research or guidelines for police, lawyers, barristers, judges and jurors which detail the capabilities and impairments of an intoxicated witness, or how best to aid their recall. With so little research having been conducted to understand the abilities of intoxicated witnesses, any provided advice would therefore be unsubstantiated. The personal opinion and experience of individual legal professionals is ultimately what currently determines whether an intoxicated witness's recall is presented in court. In turn the personal opinion and experience of the jurors governs the guilt of the defendant. Guidelines based on sound, verifiable, and robust evidence are therefore needed for this subjective assessment of alcohol's effect on recall to be replaced and to allow justice to prevail.

1.1.3. Structure of the thesis.

The rest of this chapter reviews the literature pertaining to the areas of alcohol and eyewitness memory. The psychobiological and cognitive effects of consuming alcohol will be discussed and a distinction made between blood and breath alcohol concentrations. The legal definition of intoxication around the world will be also considered, as will the variety of impairments suffered as blood alcohol concentration increases. Alcohol's effect on an individual's neurological functioning will be detailed, as well as how different types of memory are influenced by intoxication. This will lead to a discussion of the alcohol and eyewitness research that has been conducted to date, focusing on the recollection of event details, before examining the methodological issues associated with conducting alcohol research. The empirical research that has been conducted within this thesis is reported in Chapters 2 to 7. Further details of this research, including the hypotheses tested, are given at the end of this chapter. Finally, a summary and discussion of the findings are presented in Chapter 8 along with theoretical, practical and methodological implications of the research.

1.2. Psychobiological and Cognitive Effects of Alcohol

Alcohol is a legal drug, and like its illegal counterparts such as cannabis and cocaine can be addictive and just as damaging to the person consuming it (Kuhar, 2012). In fact, in 2014, 8697 deaths in the UK were directly related to alcohol (ONS, 2015a). In the short-term alcohol causes changes in an individual's body and brain, and it is these changes that will be considered in this thesis. In the longer- term alcohol addiction (or alcoholism) can have a devastating effect on a person's life, health, career and relationships. Within the UK, the National Health Service estimates that approximately 9% of men and 3% of women show signs of alcohol dependence (McManus, Meltzer, Brugha, Bebbington, & Jenkins, 2009), namely that alcohol becomes such an important factor in a person's life that they feel unable to function without it. These individuals can build up a tolerance to alcohol such that higher quantities need to be consumed to produce the same effects as before the alcohol tolerance was established (National Institute on Alcohol Abuse and Alcoholism (NIAAA), 1995). Consequently, for their own health, and to reduce confounding variables, individuals who display signs of alcohol dependence did not participate in the research within this thesis.

1.2.1. Production of alcohol.

Alcohol can take a range of forms from the chemically simple structure of methanol (wood alcohol) to the more complex Cetyl alcohol (Myers & Isralowitz, 2011). Ethyl alcohol or grain alcohol, however, is the most commonly recognised variety as it is this that is used in alcoholic beverages (Rogers, 2011). Pure alcohol is colourless, flammable and has a slight odour which is derived primarily from the short carbon chain (2 atoms) and the hydroxyl group associated with all alcohols (Buglass, McKay, & Lee, 2011). Through the fermentation of sugars by microscopic yeast cells ethanol is produced. These sugars come from a variety of sources such as barley to produce beer, grapes to make wine, or rice to yield sake (Laberge, 2009). This natural fermentation can continue until the yeast dies and an alcohol concentration of around 15% is achieved (Maiorella, Wilke, & Blanch, 1981). To produce alcoholic beverages with higher alcohol contents (up to 95%), the water in the fermented sugars are boiled off so that the resulting alcoholic vapour can then be cooled. Spirits such as whisky, rum, tequila and vodka are produced through this distillation process (Buglass et al., 2011).

The resulting alcohol content of the beverage is indicated as a percentage of the entire drink followed by ABV, or Alcohol By Volume; for example, 40 ABV vodka contains 40% pure alcohol (Meyer & Quenzer, 2013). Alcoholic content may also be defined by the amount of ethyl alcohol in the liquid at 60 degrees Fahrenheit; this is known as alcohol proof (Agarwal & Goedde, 2012). In the UK alcohol proof is equal to approximately 1.75 times the ABV, but in

the US alcohol proof is defined as twice the percentage of ABV (Rogers, 2014). Within the UK it is ABV (also known as vol.) rather than alcohol proof that is now applied. However, as alcoholic drinks come in different strengths and measures, UK Government alcohol guidelines are set in terms of units where one unit is equivalent to 10ml of pure alcohol. This equates to, for example, 25ml of 40% ABV alcohol or a shot of vodka, whilst 175ml of 12% ABV alcohol is 2.1 units or a glass of wine (House of Commons Science and Technology Committee, 2012). Although there are no safe limits of alcohol consumption, the UK Government now recommends that both men and women should not regularly drink more than 14 units of alcohol a week, and that this should be spread evenly over at least three days (Department of Health, 2016).

1.2.2. Biological effects of intoxication.

When alcohol is swallowed, the liquid is distributed into the body via the gastrointestinal tract. Once in the stomach, around 10 - 20% of the small alcohol molecules move across the membrane barriers into the bloodstream, whilst the remaining 80 - 90% is absorbed through the upper part of the small intestine (Kittleson, 2005). The speed at which alcohol is distributed from the stomach to the intestine and then absorbed by the blood is accelerated if a more concentrated alcoholic beverage is consumed. Swallowing a greater quantity of alcohol over a shorter time period has the same effect (Tilstone, Savage, & Clark, 2006), resulting in a higher blood alcohol level (Buglass et al., 2011). From the small intestine, the alcohol rich blood then flows to the liver. The liver, however, is only capable of oxidising around one unit (10 ml (8g) of pure alcohol or 25ml of 40% ABV or 70 proof alcohol) an hour (Buglass et al., 2011).

Any alcohol entering the liver above 10 ml of pure alcohol an hour is not metabolised immediately and instead continues to be circulated to the heart, the lungs and then back to heart to be dispersed throughout the body via the arterial supply (Lieber, 2000). As the alcohol circulates in the body's blood stream it enters and is dissolved in the water of each tissue, except fat (Hanson, Venturelli, & Fleckenstein, 2015). With the alcohol molecules suspended in blood they reach organs such as the brain, lungs and liver particularly quickly as these structures are dense with blood vessels (Stolerman, 2010). As alcohol is distributed throughout the body via the bloodstream, most organs are affected which in turn creates a range of biological effects of intoxication. Typically, the brain is protected from the effects of chemicals and drugs by the filter qualities of the blood/brain barrier (Charness, 1993). Alcohol, however, with its simple molecular structure is able to pass though this barrier to impair the functioning of the frontal, parietal, temporal and occipital lobes (Dasgupta, 2011).

1.2.3. Blood alcohol vs. breath alcohol concentration.

Around 2-5% of the alcohol in a human body is removed not only through urine and perspiration, but also via breath and the kidneys (Jones, 2006); the remainder is metabolised by the liver. When an individual breathes, oxygen from the air in the lungs is transferred into the blood stream. The by-product, carbon dioxide, then flows back from the blood into the lungs for exhalation from the body (Chiras, 2011). If an individual has consumed sufficient alcohol, then a proportion of that alcohol evaporates along with the carbon dioxide (Paton, 2009). During a forced exhalation, it is the alcohol content of the deep lung air that a breathalyser measures. This in turn can be used to estimate an individual's blood alcohol concentration (BAC) (Rao, 2012).

The quantity of alcohol that is exhaled with each breath is dependent on the concentration that is flowing within the blood as per Henry's Law (see Jones, 1990). This law states that for a set concentration of a volatile substance in water, at a fixed temperature, the ratio of the substance in the air above the water is also fixed. Alcohol in the body therefore conforms to Henry's Law as it is a volatile compound and diffuses in body water. As an extremely water soluble drug, the concentration of alcohol in an individual's veins will be lower than that found in their arterial blood. The latter sample most closely reflects an individual's breath alcohol concentration (Jones & Andersson, 2003). Due to ease of administration, police officers within the UK use a breathalyser for the initial assessment of an individual's degree of intoxication (Home Office, 2016). Blood or urine tests may be administered if an individual's breath sample is up to 40% over the relevant drink drive limit (Wyatt, Squires, Norfolk, & Payne-James, 2011) (see section 1.2.6. Blood alcohol and legal intoxication, for further discussion of the drink drive limit).

For research purposes the concentration of alcohol in an individual's blood can be expressed in four different units depending on the country in which the measurement is being taken (see Table 1.1). Each measurement defines blood alcohol concentration (BAC) as either a mass of alcohol per volume of blood or a mass of alcohol per mass of blood. For example, within the UK an individual with a BAC of 80mg/100ml has 80 milligrams of alcohol per 100 millilitres of blood, indicating that eight one hundredths of one percent of the person's blood is alcohol. This measurement relates to the milligrams of the chemical ethyl alcohol (ethanol) suspended within blood, not the milligrams of the actual alcoholic beverage consumed.

Table 1.1: Blood Alcohol Measurement Units by Country

Country	Units of Measurement	Blood Alcohol Measurement	England Drink Drive Limit
UK & Canada	Milligrams of alcohol per 100ml of blood	mg/100ml, mg/100mL	80mg/100ml
French speaking Europe & Spain	Grams of alcohol per one litre of blood	g/L, ‰ w/v	0.80g/L
German speaking Europe & Scandinavia	Grams of alcohol per one kilogram of blood	g/Kg, ‰ w/w	0.75g/Kg
United States, Australia	Grams of alcohol per 100ml of blood	% BAC, g/100ml	0.08%

Breath alcohol concentration (BrAC) can also be defined in four units of measurement (see Table 1.2), each expressing intoxication levels as a mass of alcohol per mass of breath. As with BAC, alcohol refers to ethanol rather than the alcoholic beverage swallowed. Within this thesis intoxication will be measured by breathalyser due to its ease of use, convenience, reliability and forensic relevance (Bates, Brick, & White, 1993). Subsequently BrAC measurements will be reported in mg/L as per the units of measurements used within the UK.

Table 1.2: Breath Alcohol Measurement Units by Country

Country	Units of Measurement	Breath Alcohol Measurement	England drink drive limit
UK	Micrograms of alcohol per one hundred millilitres of breath	mg/L, µg/100ml, µg/%	0.35mg/L 35µg/100ml
Netherlands	Micrograms of alcohol per litre of breath	µg/L, µg/l, µg/1000ml,	350µg/L
Europe	Milligrams of alcohol per litre of breath	mg/L, mg/l	0.35mg/L
USA	Grams of alcohol per 210 litres of breath	g/210L, g/210l	0.08g/210L

1.2.4. Converting blood alcohol to breath alcohol concentration.

Henry's Law predicts that in a closed system at a constant temperature, when a substance such as alcohol is combined with a liquid such as blood, the concentration of alcohol in the ensuing vapour, in this case alveolar air, will be proportional to its strength in the blood (Skelton, 2011). The resulting ratio between the concentration of alcohol in an individual's venous blood and in their exhaled breath is known as the blood-breath ratio (BBR; Jones, 1990; Jones & Andersson, 1996). However, the BBR is subject to some limitations (Jones, 1978; Jones & Andersson, 1996; Pavlic, Grubwieser, Brandstätter, Libiseller, & Rabl, 2006; Wright, Jones, & Jones, 1975), due to arguable deviations from the assumptions of Henry's Law (Vij, 2014). Such deviations include the human body not being a constant temperature (Shaw & Kwong, 2001), and the fact that alcohol in exhaled breath is not the same as in alveolar air due to interactions throughout the respiratory tract (Jones, 1990). Nevertheless, a considerable body of research indicates that the ratio can consistently and accurately predict BAC from BrAC (Cobb & Dabbs, 1985; Cowan, Burris, Hughes, & Cunningham, 2010; Gainsford, Fernando, Lea, & Stowell, 2006; Jones & Andersson, 1996; Jones and Andersson, 2003; Stowell, Gainsford, & Gullberg, 2008).

The exact BBR applied depends on the country in which the analysis is being conducted. The concentration of alcohol in blood, however, is over 2000 times greater than in breath. Within the UK and Ireland, the legal ratio adhered to is 2,300: 1, whilst in the USA the ratio is 2,100: 1 (Jones, 2010). This thereby assumes that 2300ml or 2100ml of breath contains the same amount of alcohol as 1ml of blood. The higher the conversion ratio the lower the breath alcohol reading will be compared with the blood alcohol concentration. So, a breath sample will equate to a lower blood alcohol concentration in the USA than the same reading in the UK (as seen in Table 1.3 where the drink drive limit for England, Wales and Northern Ireland is in bold). As an individual's BBR can vary over time there is an almost arbitrary nature to these ratios, but there is support for each of these conversion ratios (Borkenstein & Smith, 1961; Emerson, Holleyhead, Isaacs, Fuller, & Hunt, 1980; Wright et al., 1975). Subsequently 2,300: 1 is the statutory ratio used to convert blood to breath alcohol concentrations in the UK. Within this thesis, it is also this ratio that will be used to allow comparisons with alcohol and memory research that used BAC rather than BrAC.

Table 1.3: BrAC to BAC: Employing a BBR of 2,300:1 and 2,100:1

Breath Alcohol Concentration		Blood Alcohol Concentration			
		mg/100ml BAC		% BAC	
µg/100ml	mg/L	2300:1	2100:1	2300:1	2100:1
25	0.25	57	52	0.057	0.052
30	0.30	69	63	0.069	0.063
35	**0.35**	**80**	**73**	**0.080**	**0.073**
40	0.40	92	84	0.092	0.084
45	0.45	103	94	0.103	0.094

1.2.5. Neurophysiological effects of intoxication.

Within minutes of being consumed, alcohol begins to affect the normal chemistry and functioning of the brain by altering the neurotransmitters capable of conducting chemical messages around the body (see Chastain, 2006). Through adjustments to the biological system that regulates an individual's emotions, behaviours and cognitive processes, the effects of alcohol can be observed. Inhibitory amino acid neurotransmitters such as gamma-amino butyric acid (GABA) typically reduce the level of neurotransmission within the brain to prevent hyperactivity and seizures. This hyperpolarization slows functioning down to maintain normal and balanced operations within the brain. When alcohol is introduced, though, these effects are amplified slowing the functioning of the brain further. Excitatory neurotransmitters, such as glutamate, in contrast, increase the energy levels and activity in the brain. Alcohol consumption, though, inhibits the release of these chemicals, so that brain functioning is also slowed. This is accompanied by a comparable effect on behaviour. Of the three basic types of glutamate receptors, the N-methyl-d-aspartate (NMDA) receptor is the most sensitive to the effects of alcohol (Weight, Peoples, Wright, Li, Aguayo, Lovinger, & White, 1993). Research indicates that when the NMDA receptor is disabled then long-term potentiation (LTP) or the strengthening of the responsiveness between cells due to repeated activation, is blocked (Bliss & Collingridge, 1993). LTP is believed to occur naturally in the brain during learning (see Martin & Morris, 2002). After just a single alcoholic drink, however, studies indicate that there is a 30% reduction in LTP, with increasing levels of intoxication resulting in greater reductions (Blitzer, Gil, & Landau, 1990; Pyapali, Turner, Wilson, & Swartzwelder, 1999; Schummers & Browning, 2001). GABA and glutamate receptors in the reward centres of the brain, such as the amygdala, are also affected by alcohol consumption resulting in a reduction in anxious thoughts and an improvement in mood, at least initially

(Koob, 2004). Further to this, as glutamate and GABA receptors are located throughout the brain, a wide range of functions are impaired by intoxication, as seen in Table 1.4. These impairments occur in all four lobes of the cerebral cortex. The frontal lobe of the brain is typically associated with reasoning, motor skills, higher level cognition and expressive language (Orrison, 2008). At low blood alcohol levels, of around 20-30 mg/100ml, individuals experience only minimal physical effects coupled with a slight elevation in mood, but no corresponding depressant effects or deficiency in co-ordination (Dasgupta, 2011). Once the alcohol molecules penetrate the blood brain barrier at the frontal lobe, at a BAC of 40-60 mg/100ml, there is interference to the reasoning processes which increases risk taking (Parker, Harford, & Rosenstock, 1994), diminishes alertness (Nuotto, Mattila, Seppälä, & Konno, 1982) and lowers inhibitions (Zeigler et al., 2005). As BACs rise to 70-90 mg/100ml alcohol also has a detrimental effect on the pain, touch and speech processes of the parietal lobe (Calhoun et al., 2004). As BACs rise to 90-125 mg/100ml alcohol has a detrimental effect on fine motor skills with hand-eye co-ordination suffering considerably and resulting in slower reaction times to stimuli (Luchtmann et al., 2013; Maylor & Rabbitt, 1993; Sidell & Pless, 1971). The hippocampus and auditory cortex are located within the temporal lobe of the brain and are essential for memory formation and comprehension of language and sound processing respectively (Orrison, 2008). When sufficient alcohol is consumed to act appreciably upon the temporal lobe, at around BACs of 130-160 mg/100ml, slurred speech (Perham, Moore, Shepherd, & Cusens, 2007) and impaired hearing (Upile et al., 2007) are exhibited, coupled with memory loss and disruption to the formation of new autobiographical memories (White, 2003).

The last area of the cerebral cortex to be affected by alcohol is the occipital lobe. In an unimpaired brain, this region allows the interpretation of visual information from the eyes. Intoxication, at around double the drink drive limit for England, Wales and Northern Ireland (160-190 mg/100ml), thereby results in distorted vision and poor judgement of distances (Oxley, Lenné, & Corben, 2006). Due to this impairment to visuo-motor co-ordination, the completion of everyday tasks such as walking and dressing also become problematic (Ferreira, De Mello, Pompéia, & De Souza-Formigoni, 2006). As BACs are raised to 200 mg/100ml alcohol has a depressant effect on the central nervous system and individuals experience the anaesthetic qualities of intoxication.

If alcohol then begins to affect the brain stem, where involuntary but potentially life-saving actions such as sneezing and coughing are controlled, then it is possible for the vital reflex centres located there to fail, and to potentially lead to the death of the individual. If for example, the gag reflex is compromised (see Garriott, 2008; Shepherd, 2011) then instead of

vomiting an individual could asphyxiate. With BACs of 250 mg/100ml all sensory, physical and mental abilities are severely compromised and the chances of serious injury or asphyxiation are increased. BACs of 300 mg/100ml and higher typically result in individuals becoming largely unaware of their surroundings, potentially resulting in a sudden loss of consciousness (Dasgupta, 2011). At BACs of 350 mg/100ml - the level attained in surgical anaesthesia - a coma is possible, whilst for BACs of 400 mg/100ml or higher a coma is the typical outcome of intoxication (Maisto, Galizio, & Connors, 2014). At even higher BACs there is a 50:50 chance of dying by respiratory failure (Sadock & Sadock, 2008).

Table 1.4: Blood and Breath Alcohol Content and Corresponding Effects

BrAC mg/L	BAC mg/100ml		BrAC mg/L	BAC mg/100ml	
0.09 – 0.12	20 – 30	Mild relaxation, Loss of shyness, Light headedness	0.39 – 0.53	90 – 120	Increased recklessness
0.18 - 0.26	40 – 60	Lower inhibitions, Impaired balance, Slurred speech, Impaired vision and hearing	0.57 – 0.70	130 – 160	Inflated emotional, Acute judgement failure
0.31 - 0.39	70 – 90	Slowed reactions, Impaired judgement, Impaired self-control	0.70 – 0.83	160 – 190	Nausea, Rage
			0.88	200	Dazed and confused, Blackouts likely
			1.31	300	Trancelike state

Note: Adapted from Dasgupta (2011).

1.2.6. Blood alcohol and legal intoxication.

The rate at which alcohol is absorbed, distributed and metabolised by the body depends on a variety of factors, for example, age (Jones & Neri, 1985), gender (Brouwer, 2004), body weight/proportion of muscle or fat (Kalant, 2005), alcohol consumption rate (Jones & Vega, 1973; Moskowitz & Burns, 1976), quantity/strength of alcohol (Winek & Esposito, 1985), type of mixer (Roberts & Robinson, 2007), quantity of food in the stomach (Jones & Jönsson, 1994; Ramchandani, Kwo, & Li, 2001) and whether medication is being taken (Kechagias, Jönsson,

Norlander, Carlsson, & Jones, 1997; Roine, Gentry, Hernández-Munõz, Baraona, & Lieber, 1990). These variables all play a role in the speed at which the body processes alcohol, so that a single dose can lead to a range of blood alcohol levels across the population. Despite the influence of these variables larger doses of alcohol generally result in relatively higher BACs and increased levels of impairment as seen in Table 1.4.

Whilst the effects of intoxication detailed in section 1.2.5 (Neurophysiological effects of intoxication), reflect the general impairments suffered by individuals, each person is likely to be affected differently. Intoxication is therefore an abstruse and inconstant variable, where the only fixed and objective indication of inebriation is the legal drink drive limit. As a result, legal intoxication within England, Wales and Northern Ireland equates to a blood alcohol concentration exceeding 80mg/100ml, or the corresponding breath alcohol concentration of 0.35mg/L. At these levels of intoxication, the chance of a vehicular accident is six times more likely than if the driver was sober, as individuals are likely to believe they are operating at a more competent level than reality indicates (Killoran, Canning, Doyle, & Sheppard, 2010).

Countries differ in their drink drive limit. Whilst North America has the same drink drive limit as England, Wales and Northern Ireland (80mg/100ml), Scotland and Finland have a drink drive limit of 50mg/100ml. Norway, the Netherlands, and Sweden, however, have a drink drive limit of only 20mg/100ml (see Desapriya, Iwase, Brussoni, Shimizu, & Belayneh, 2003; Sweedler et al., 2004). As countries employ different blood to breath ratios, the BrAC intoxication limit for each country need not be the same even if the BAC levels are the same. As a result, the evidential breath-alcohol tests completed by the police in the UK are not used to approximate the venous BAC, but rather as an indication of whether an individual has consumed more alcohol than is permitted by law when in control of a vehicle.

1.3. Alcohol and Memory Research

Since the mid-20th Century, human memory has been modelled upon three successive stages: encoding, storage and retrieval (Melton, 1963; Tulving, 1983). Within this memory system, visual, acoustic and semantic information is initially received and processed before a more permanent cognitive record is created for potential later short or long term recall. In regards to long term memory, as in eyewitness recall, contemporary theories consider there to be two distinct thought processing paths which are available when completing a cognitive task. Whilst there are numerous theoretical models of cognition that may be considered dual-process (e.g. Kahneman, 2011; Metcalfe & Mischel, 1999; Wenzlaff & Wegner, 2000; Zárate, Sanders, & Garza, 2000), the central principle of these models is the relationship between

automatic/implicit and controlled/explicit processing (Chaiken & Trope, 1999; Evans, 2008; Smith, & DeCoster, 2000). Within this dual-process framework, the first pathway or system of thought processes are described as swift, automatic, non-conscious and involuntary. In contrast, the second pathway is slow, deliberate and voluntary, with the individual being consciously aware that the process is occurring.

1.3.1 Alcohol and general memory research.

According to Parker et al. (1980) each stage of memory (encoding, storage and retrieval) is affected differently when an individual is intoxicated. Research (see White, 2003) indicates that when alcohol is consumed prior to encoding, memory for the event can be impaired or in some cases completely blocked from being transferred from short to long-term memory storage. The intoxicated individual may then not be able to later retrieve the memory (i.e., anterograde amnesia). Long-term memories created before intoxication, however, remain intact (Parker, Birnbaum, & Noble, 1976). Studies also suggest that recall may be enhanced when alcohol is administered post memory formation (Bruce & Pihl, 1997; Garfinkel, Dienes, & Duka, 2006; Knowles & Duka, 2004; Moulton et al., 2005). Further to this, ingestion of alcohol during retrieval can also affect recall, but less so than at encoding (Söderlund, Parker, Schwartz, & Tulving, 2005).

Studies indicate, though, that the relationship between alcohol and memory may be more complicated, and depend greatly on the type of recall or processing involved (Lister, Gorenstein, Risher-Flowers, Weingartner, & Eckhardt, 1991; Ray, Bates, & Bly, 2004; Tracy & Bates, 1999). Long-term explicit, declarative or controlled memory processing for example, is composed of both episodic and semantic recall (Tulving 1972, 1983), where conscious and intentional effort is required to remember information. Traditional memory research indicates alcohol affects these abilities to differing degrees (Ray & Bates, 2006). The extent of impairment depends greatly on the type of material to be retrieved and the means through which this is attempted. For example, episodic memory (Tulving 1972, 1983), which deals with an individual's recollection of a specific event, such as witnessing a crime, has been shown to be particularly impaired by intoxication (Curran & Hildebrandt, 1999; Nilsson, Bäckman, & Karlsson, 1989). The effect of alcohol is especially apparent with the use of free recall (Hashtroudi, Parker, DeLisi, Wyatt, & Mutter, 1984) and recognition of completed word fragments (Söderlund et al., 2005). It is encoding rather than retrieval, however, that seems to be affected to the greatest extent by alcohol, although there is to date little research comparing the two directly (Birnbaum, Parker, Hartley, & Noble, 1978; Goodwin, Powell, Bremer, Hoine, & Stern, 1969; Petersen, 1977). For semantic details, which encompass more

general information such as an individual's name or the capital of England, intoxication has less of an impact (Hartocollis & Johnson, 1956; Wendt & Risberg, 2001). However, irrespective of the nature of the explicit memory, the impairment to recall as a result of intoxication may be seen up to a week later (Söderlund et al., 2005).

In contrast to explicit memory, implicit recall or thought processing does not require conscious effort or even a specific intention to evoke the memory – it is an automatic process. Such tasks rely on previous experience to complete them and, as is the case with priming experiments (Schacter, 1994), implicit memory is usually unaffected by alcohol consumption for tasks such as word stem completion, colour naming and identification of degraded words (Duka, Weissenborn, & Dienes, 2001; Fillmore, Dixon, & Schweizer, 2000; Hashtroudi et al., 1984). Alcohol therefore appears to impair the slower explicit/controlled information processing pathway in long term memory, whilst the implicit/automatic pathway is largely unaffected by intoxication. Further to this, general memory research suggests that the encoding and storage of novel information is impaired, whilst older previously-acquired items are unaffected (Parker et al., 1976). Consequently, the focus of this thesis is on long-term episodic memory recall, and alcohol induced anterograde (as opposed to retrograde) amnesia; namely how alcohol affects eyewitness recall when consumed before the encoding of a criminal event.

1.3.2. Alcohol Myopia: Theory of intoxication.

Research suggests that the consumption of alcohol can have a variety of effects, depending on the individual and the situation. For example, alcohol has been seen to relieve stress, anxiety and tension (e.g. Levenson, Sher, Grossman, Newman, & Newlin, 1980; Polivy, Schueneman, & Carlson, 1976), but also increase anxiety and stress (e.g. Abrams & Wilson, 1979; Keane & Lisman, 1980). Alcohol can make individuals more aggressive (e.g. Zeichner & Pihl, 1980), but more altruistic (e.g. Steele, Critchlow, & Liu, 1985). Intoxication can also boost a person's ego (e.g. Banaji & Steele, 1989); yet also leave them depressed (Steele & Josephs, 1988). This led Steele and Josephs (1988) to consider whether alcohol could indirectly trigger extreme social behaviours in an individual by preventing them from reacting to cues in what would be considered a normal manner. As a consequence, Steele and Josephs proposed an attention-allocation model whereby alcohol is understood to affect behaviour via cognitive and perceptual impairments. These deficits, Steele and Josephs indicated, have been shown to affect most elements of an individual's information processing from their capacity to encode a multitude of situational cues (e.g., Washburne, 1956), to their ability to attend to numerous cues simultaneously (Medina, 1970; Moskowitz & Depry, 1968) and the mental

processing necessary to encode new information into memory (e.g., Birnbaum, Johnson Hartley, & Taylor, 1980).

As the task or activity being performed becomes more complicated, a greater level of controlled processing is required. Steele and Josephs (1988) proposed the increased concentration competes with an individual's stress, distracting them from their anxiety. In contrast, a simpler task requires less attention and will provide less distraction, thereby not reducing psychological stress to the extent that a complex task would. The researchers also indicate that if the demanding task is complex enough, this so-called "narrowing of attention" can also diminish stress experienced by sober individuals. A considerable body of research has been amassed to support this allocation of attention in explaining an intoxicated individuals' sexual risk taking behaviour, for example, a greater intention to have unprotected sex when intoxicated (e.g., Griffin, Umstattd, & Usdan, 2010; MacDonald, Fong, Zanna, & Martineau, 2000; MacDonald, MacDonald, Zanna, & Fong, 2000).

It is upon these conclusions that Steele and Josephs (1990) proposed the theory of Alcohol Myopia (AMT), where alcohol is posited to affect an individual by either restricting the cues that are perceived, or by reducing the ability to process information. The theory states that the range of cues an individual perceives whilst intoxicated is restricted due to a disproportionate amount of attention being given to immediate salient cues, whilst weaker, less salient cues, subsequently receive less attention. Alternatively, alcohol can affect cognitive functioning by reducing an individual's ability to process and extract meaning from the information or situation they are facing. As consequence, they are unable to participate in the more involved and effortful processing necessary to integrate the new information into their existing body of knowledge. In accordance with Steele and Josephs' theory, that alcohol reduces an individual's attentional capacity; intoxicated individuals in turn would be expected to focus more exclusively on the primary aspects of an event at the expense of other, more trivial, details. Research (Clifasefi, Takarangi, & Bergman, 2006) supports this premise, with intoxicated individuals (M_{BAC} = .04%) being less likely than a sober person to notice an abnormal salient item when completing another task that demands their attention. Clifasefi et al. (2006) found that whilst 46% of sober individuals noticed the gorilla while they were counting the number of ball tosses in Simons and Chabris' (1999) gorilla video, only 18% of intoxicated participants noticed the salient gorilla detail.

Steele and Josephs (1990) initially proposed Alcohol Myopia as a social psychological theory, and as a means to explain how and why alcohol can affect the same individual's personal behaviour differently on separate social occasions. For example, an employee who has a disagreement with their employer may control his or her temper when he or she is

sober. However, having consumed alcohol the employee no longer controls his or her temper. The myopia caused by the alcohol has reduced the worker's access to less salient cues, such as a colleague trying to distract him or her from the employers' presence. Through a disproportionate amount of attention being given to the more immediate, salient cues (i.e., showing annoyance) the weaker less salient cues (i.e., the colleague) are largely neglected. As a result, AMT predicts an intoxicated individual will have only the most cursory understanding of the strongest salient elements of an event (i.e., displaying anger), and that this will be what guides the individual's emotions and behaviours. With increased alcohol consumption, the drinker demonstrates increasing signs of myopic behaviour with their focus restricted even further to only the most salient features of a situation. However, as already indicated AMT has its roots in explaining the *behaviour* of intoxicated individuals rather than as an explanation of the *cognitive* functioning that is altered through alcohol. Despite this focus on behaviour, AMT clearly hypothesises an important role for an individual's attentional processes when explaining the effects of alcohol on cognition. This in turn has led researchers to extrapolate the theory to account for the visual perception and memory of intoxicated witnesses.

1.3.3. Recall of eyewitnesses.

Research into the effects of alcohol on eyewitness memory is still in its infancy with only 19 studies having been published to date. Of these, eight relate to a witness's ability to correctly recall an event they had previously witnessed whilst intoxicated (Flowe et al., 2016; Hagsand et al., 2013a; Hagsand et al., 2016; Hildebrand Karlén et al., 2015; La Rooy et al., 2013; Schreiber Compo et al., 2011; Schreiber Compo et al., 2012; Yuille & Tollestrup, 1990). The remaining 11 intoxication studies look at the recall of a static forensically related image (Harvey et al., 2013a, 2013b), a witness's identification performance (Dysart et al., 2002; Hagsand et al., 2013b; Kneller & Harvey, 2016), cross-race face learning (Harvey, 2014), false face recognition (Colloff & Flowe, 2016), the effect of an intoxicated co-witness (Zajac et al., 2013) and the recall of a perpetrator (Read et al., 1992; Van Oorsouw & Merckelbach, 2012; Van Oorsouw et al., 2015). What now follows is a summary of the most relevant research papers that have investigated the effects of alcohol on witness recall. These studies are presented in chronological order, after first discussing the two studies that have employed static stimuli images. Research that has looked at line-up decisions, cross-race face learning, intoxicated co-witness and intoxicated perpetrator recall will not be discussed.

1.3.3.1. Harvey, Kneller, and Campbell (2013a).

To test Alcohol Myopia's assertion that intoxication narrows the focus of visual attention to the highly salient details of a visual scene, Harvey et al. (2013a) examined the eye movements of participants. After consuming alcohol (98% ethanol dose = 0.6ml/kg; M_{BrAC} = 0.28mg/L or M_{BAC} = .06%) or plain orange juice (control) each participant was shown either an emotionally high or low salience photograph. The high salience image depicted a conflict in Tehran between police officers and civilians, whilst the low salience image was of buskers playing in a busy town centre. Additionally, within each image centrality was determined by semantic relevance and retinal eccentricity (the angular distance from the fixation point (fovea) to a given point in the visual field). The eye-tracker enabled a rectangular area of interest to be constructed around the central region of each image graphically. Central details were those that were in the middle or centre of the visual display of each image, whilst the remaining details were considered peripheral. Whilst looking at the image for ten seconds, all participants had their eye movements recorded by an eye-tracker. The next day participants returned to the laboratory, and whilst sober were individually asked to verbally recall anything they could remember from the image they viewed. Recalled details were coded as either accurate (i.e., a detail from the central or peripheral region of the image), inaccurate (i.e., a detail not seen in the peripheral or central region of the image) or unscorable (i.e., a detail that was seen in both or neither the peripheral or central region of the image).

Harvey et al. (2013a) found that the centre of the high salience image attracted more visual attention than the centre of the low salience image. In addition, intoxicated participants made more fixations to the central region of both images than their sober counterparts; however, this difference was not significantly greater for the high than the low salience image. In regards to recall, significantly more central details were recalled from the high compared with the low salience image. Whilst intoxicated participants recalled significantly fewer details than sober participants on both the high and low salience images, no interaction was indicated between drinking condition, salience and centrality. Ultimately, although alcohol was seen to narrow the foveal attention of participants to the centre of both images, this did not aid recall of items in this area. Contrary to AMT's predictions intoxicated participants did not recall significantly fewer peripheral details than sober individuals. Harvey et al. concluded that these findings support the extension of AMT from the social consequences of intoxication to the recall of visual scenes at moderate levels of intoxication. From a forensic perspective, however, the stimuli images were static and do not reflect the moving and complex nature of the events that an eyewitness would recall.

1.3.3.2. Harvey, Kneller, and Campbell (2013b).

To determine whether alcohol affects an individual's ability to explore and recognise the contents of five forensically relevant static images, Harvey et al. (2013b) again recorded the eye-movements of participants. After drinking alcohol (98% ethanol dose = 0.6ml/kg; M_{BrAC} = 0.11g/210L or M_{BAC} = .12 %) or plain orange juice (control) participants sat at the eye-tracker, and were asked to freely view a sequence of images depicting a lone man stealing a mobile phone. In the laboratory the following day, when sober, participants completed a true/false recognition test. Within the test, the man's actions and his possessions were deemed to be central details, whilst all other items were classed as peripheral. Harvey et al. found that participants who consumed alcohol did not make significantly fewer eye fixations than their sober counterparts, and there was no interaction between drinking condition and information centrality. In terms of recall, both sober and intoxicated participants accurately answered fewer central than peripheral questions. Overall recall accuracy for both central and peripheral details, however, was not affected by the levels of intoxication within the study. No interaction between information centrality and drinking condition was indicated. The discrepancy between the findings of Harvey et al. (2013b) and Harvey et al. (2013a) are primarily explained by the researchers in terms of the stimuli themselves and the different means of assessing memory in the two studies.

1.3.3.3. Yuille and Tollestrup (1990).

In the first published alcohol and eyewitness study, Yuille and Tollestrup (1990) had male participants watch a complex live theft whilst sober, intoxicated (95% ethanol dose = 1.32ml/kg; M_{BAC} = .10%), or after drinking a placebo. Half of the participants in each condition provided both immediate and delayed verbal recall (a police interview a week later, when sober), whilst the remainder were tested only after the delay. Each remembered detail was classified as either an action or description detail and coded as accurate, inaccurate or unscorable (e.g., the subjective state of the witness). Accurate and inaccurate details were also assigned a score which reflected the amount of information it contained.

Yuille and Tollestrup's (1990) initial analyses indicated no significant differences between placebo and control participants on any of the recall measures. When participants were interviewed twice, more details were recalled in the delayed than the immediate interview, although the former was significantly less accurate. Those participants who consumed alcohol provided significantly fewer scorable details in both the immediate and delayed interviews. Further to this, intoxication resulted in a small but significant reduction in the overall accuracy of recall. Whilst the completion of an immediate recall task increased the quantity of information provided by participants in the delayed interview, this had no effect

on the accuracy of that recall. Intoxication however had a small but negative effect on the accuracy and quantity of details recalled in the delayed interview irrespective of whether participants had completed an immediate interview. As intoxicated individuals exhibited a deficit in recall, not only immediately after consuming the alcohol, but also a week later, Yuille and Tollestrup concluded that moderate levels of intoxication impair the encoding of the event rather than directly affecting retrieval.

Although Yuille and Tollestrup's (1990) research has provided a valuable contribution to the field of eyewitness memory, the study is not without methodological issues. Foremost amongst these concerns is the extent to which participants were intoxicated. A mean BAC of .10% was obtained from the twelve participants who consumed the alcohol and were breathalysed. The drink drive limit in Canada, where this study was conducted, is .08%, so participants were legally intoxicated when they witnessed the event. The issue, however, is that 47 individuals were in the alcohol condition and only 26% were breathalysed. With a wide range of biological and situational variables affecting an individual's blood alcohol content, it is not possible to conclude that a mean BAC of .10% would be representative of the group, had all participants been breathalysed. As a consequence, although Yuille and Tollestrup found a significant difference in recall accuracy and completeness between drinking conditions, there is a general ambiguity around the extent of intoxication. This thereby restricts the reliability and validity of the conclusions that can be drawn from the research. When the researchers analysed the information recalled by participants not only did they look at the accuracy of those details, but also what they pertained to. Despite breaking down each participant's free recall into action and description details, Yuille and Tollestrup did not provide any analysis for these elements. As a result, the potential opportunity to understand whether alcohol has a discrete effect on different information types was not taken advantage of.

1.3.3.4. Schreiber Compo, Evans, Carol, Kemp, Villalba, Ham, and Rose (2011).

In an attempt to further understand the types of information affected by intoxication Schreiber Compo et al. (2011) addressed Yuille and Tollestrup's (1990) lack of analysis in relation to action and description details. Within a simulated bar-lab in Florida, participants interacted with a bartender whilst sober, intoxicated (40% vodka dose = 2.35 - 2.82 ml/kg; M_{BrAC} = 0.08g/210L or M_{BAC} = .08%) or after drinking a placebo (M_{BrAC} = 0.01g/210L or M_{BAC} = .01%). Throughout their discussion the bartender ensured that the participant's focus remained on him. Afterwards, in a separate laboratory, participants were asked to complete a written free recall task after mentally reinstating the original encoding context. Participants

were asked to detail everything they remembered from their time spent with the bartender. Each new piece of information detailed in the narrative was classified as either verifiable or unverifiable, with a further division of central, peripheral, uncertain and 'don't know' responses being made in relation to verifiable items. Those details that related to descriptions of the bartender and his actions were classified as central. Any elements recalled from the bar environment were deemed to be peripheral. Each verifiable detail was also coded as either accurate or inaccurate.

Schreiber Compo et al.'s (2011) analyses indicated that for verifiable details recall accuracy was high, with more peripheral than central details being recalled by participants. In regards to the number of central details recalled, no significant differences were indicated between the three drinking conditions. Placebo participants, however, did report more uncertain and 'don't know' responses than intoxicated participants. In terms of peripheral recall, those individuals in the alcohol condition reported significantly fewer accurate details than both the control and placebo participants. There was, however, no difference in inaccurate peripheral recall across the three drinking conditions. For unverifiable information, individuals in the alcohol condition reported significantly more subjective details than both sober and placebo participants. The study also indicated that there was no significant difference in the number of words and information units recalled by the three drinking conditions. Ultimately the study suggested that whether alcohol affects recall depends on the type of information to be remembered. Whilst intoxicated witnesses recalled as much information as sober and placebo participants, what they reported differed. Compared to sober individuals, alcohol participants provided more subjective details and less peripheral information, whilst central recall was unaffected by intoxication.

Schreiber Compo et al. (2011) argued that the increased uncertainty associated with placebo participant responses was support not only for the inclusion of a placebo condition in future research, but also for the hyper-vigilance hypothesis (Fillmore & Blackburn, 2002; Testa et al., 2006). For placebo participants, the anticipation of consuming alcohol lead to behaviours that compensated for an expected poorer recall performance (i.e. more 'don't know' responses). Intoxicated participants, however, Schreiber Compo et al. (2011) indicated, did not have the capacity to control their memories due to the alcohol they had consumed. Consequently, they were less likely to say 'don't know' than placebo participants. As individuals were equally able to recall central details irrespective of what drink had been consumed, Schreiber Compo et al. also state this supports the underlying premise of AMT (Steele & Josephs, 1990). In allocating their attention to the central aspects of the event, intoxicated participants were left with a weaker memory for the more peripheral details, as

per AMT. This did not lead to fabrication and false memories, though, as overall recall accuracy was high irrespective of beverage type. In an improvement on Yuille and Tollestrup's (1990) study, both male and female participants consumed alcohol and all were breathalysed. Despite this there remain issues with the research. Individuals who were intoxicated during their conversation with the bartender were still drunk during their free recall task; as a result the conclusions drawn were (likely to have been) confounded by the effects of state-dependency (Goodwin, Powell, et al., 1969; Parker et al., 1976; Weissenborn & Duka, 2000). In being intoxicated at both encoding and retrieval, participants who consumed alcohol in the study may have had a recall advantage over real-world witnesses who whilst drunk at encoding are sober at retrieval.

The effects of alcohol indicated in Schreiber Compo et al. (2011) may consequently be underestimating the actual recall deficits experienced by real-world witnesses. To fully comprehend the influence alcohol has on an eyewitness's memory, it is therefore necessary to ensure that participants while drunk at encoding are actually sober at retrieval. For in the real-world, police would not (knowingly) take a formal statement whilst a witness is intoxicated (Ministry of Justice (MoJ), 2011). In addition, Schreiber Compo et al. (2011) left a maximum of an hour between a participant's discussion with the bartender and their recall, which raises further questions of forensic relevance. Although this methodology may mimic any initial and immediate witness account given to the police, the actual testimony presented at court, as already indicated, will be taken when the witness is considered sufficiently sober (MoJ, 2011), and this would not occur within an hour. As a result, the time between encoding and retrieval is typically longer than the maximum of an hour afforded by Schreiber Compo et al. (2011). What effect alcohol has on explicit memory during this additional time is consequently unknown from Schreiber Compo et al.'s research.

1.3.3.5. Schreiber Compo, Evans, Carol, Villalba, Ham, Garcia, and Rose (2012).

In light of the high recall accuracy rate identified by Schreiber Compo et al. (2011), Schreiber Compo et al. (2012) examined the effects of intoxication on a witness's susceptibility to misinformation. Misinformation relates to inaccurate details that an individual is exposed to after witnessing an event (Loftus, Miller, & Burns, 1978). For example, in Loftus et al. (1978) the witness saw a car hitting a pedestrian after passing a stop sign, but after the event another witness mentions it was a yield sign. If the initial witness is susceptible to misinformation, they would report a yield sign to the police. Within the simulated bar-lab, Schreiber Compo et al.'s (2012) participants entered into a discussion with the bartender whilst sober, intoxicated (40% vodka dose = 2.35 - 2.82ml /kg; M_{BrAC} = 0.08g/210L; M_{BAC} =

.08%) or after drinking a placebo (M_{BrAC} = 0.01g/210L; M_{BAC} = .01%). All procedural elements remained the same as in the initial research, except during the written recall task when an intruder (confederate) entered the room and stole a laptop. After the theft, the experimenter made a call to report the suspicious behaviour during which central and 'less central' misinformation was introduced. Information centrality was determined by a pilot group of participants who were presented with a list of statements pertaining to details that the study participants would witness. These individuals were asked to imagine the scenario and rate how central each item was. Central information was defined as those details that would be key to the event and information that would most likely be the focus of the individual's gaze if they were a witness. Items were deemed 'less central' or peripheral if the pilot participants gave the item a low central rating. For example, for central misinformation although the laptop was on a desk, the experimenter reported that the laptop was on a table. For 'less central' misinformation, the experimenter said the intruder wore a ring when he did not. Participants subsequently completed a verbal interview with additional confederates professing to be campus security. These interviews involved an open-ended narrative, cued recall or a mixed format. Within the transcribed testimony each new unit of information was scored as correct, false, a 'don't know' response, subjective or irrelevant. Whether the detail was misinformation or control information was also noted.

Schreiber Compo et al.'s (2012) analyses indicated no significant difference in the percentage of correct, false and 'don't know' responses given by participants across drinking conditions. In addition, there were no differences in accuracy rates between sober, placebo and intoxicated participants or in the percentage of uncertain, subjective and irrelevant details recalled. These lack of effects remained even when the alcohol condition was restricted to BrACs above 0.08g/210L. With regards to false information, significantly more incorrect details were reported if the misinformation was introduced, although there was no interaction with drinking condition. A cued rather than open-ended interview was also seen to increase the number of false responses for both alcohol and placebo participants. Interview format was not seen to affect or explain the misinformation analyses findings. Ultimately moderate intoxication did not appear to affect an individual's memory, or his or her ability to reject misinformation.

Schreiber Compo et al. (2012) argued that this lack of memory impairment may have been the result of the salient encoding and open-ended recall format predominately used in this study. With this combination of encoding material and method of retrieval, Schreiber Compo et al. propose that participants were able to compensate for any cognitive deficits that may have arisen from alcohol consumption. This, the researchers claim, still fits with the

principle of Alcohol Myopia as the theory states that any cognitive differences between intoxication levels will be contingent on the specific mix of cues within a specific situation, .i.e. type of encoding and recall. As this research followed a very similar methodology to Schreiber Compo et al.'s (2011) study it also inherits the flaws and merits of that piece of research, such as state-dependency and the extent of its forensic relevance. Additionally, despite ensuring that there was a 50:50 split regarding information centrality, Schreiber Compo et al. (2012) provided no analysis of the effects of alcohol according to information type. Consequently, the opportunity to investigate whether the effect of alcohol differs depending on the type of misinformation being introduced (central vs. peripheral) was not taken advantage of.

1.3.3.6. Hagsand, Roos af Hjelmsäter, Granhag, Fahlke, and Söderpalm-Gordh (2013a).

To assess the effect of intoxication on witness recall, Hagsand et al. (2013a) asked Swedish participants to watch a video of a woman being kidnapped after they had consumed what the researchers termed a high (40% vodka dose = 0.7g/kg; M_{BAC} = .06%) or low dose (40% vodka dose = 0.4g/kg; M_{BAC} = .04%) of alcohol, or alternatively orange juice (control). A week later in a different room, when sober, participants completed a verbal standard interview. Each transcribed interview was broken down into information units relating to actions, persons, objects and descriptions. In terms of recall measures, each piece of new information was scored as correct, incorrect or undefined. Measures of recall accuracy (number of correct units/total number of units recalled) and completeness (total amount of units recalled) were also calculated. Subjective information and 'don't know' responses were ignored.

Hagsand et al.'s (2013a) analyses indicated that the recall completeness of high and low alcohol dose participants was not significantly different from that of control participants. Those who consumed a high alcohol dose, however, were significantly less complete in their recall than low dose participants. Further to this high alcohol dose participants were less complete in their recall than the low intoxication group (control and low alcohol dose combined). In terms of the accuracy of recall, no significant differences were indicated between the three drinking conditions. For both recall completeness and accuracy, no effect of gender or interaction with alcohol dose was indicated. Ultimately, these findings suggest that, compared with sober witnesses, low and moderate levels of intoxication are not particularly detrimental to the recall accuracy and completeness of eyewitnesses. These findings, Hagsand et al. argue, could be explained by the fact that, for those consuming the high alcohol dose, their BAC was still rising when they witnessed the crime, whilst those consuming a low dose had already reached the highest BAC that could be achieved and were beginning to sober up, as seen in Figure 1.1 at points A and B.

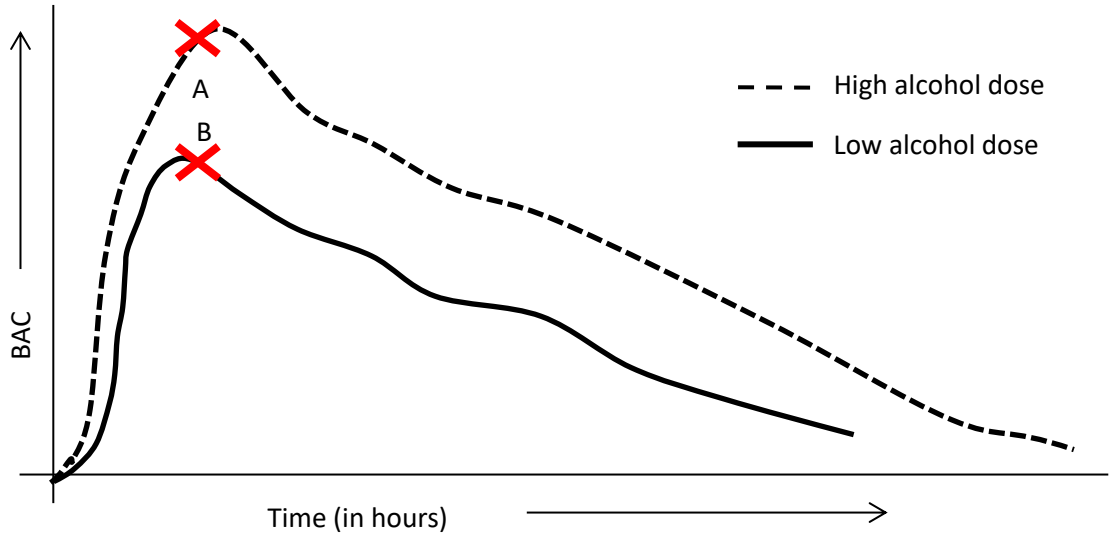

Figure 1.1: Blood Alcohol Concentration over Time

Alternatively, Hagsand et al. (2013a) indicate it might also be explained by AMT, where increased intoxication results in fewer details being encoded. Alcohol Myopia Theory, however, explains the pattern of recall in relation to the salience of the details, not the overall recall accuracy and completeness of an individual. To truly understand whether Hagsand et al.'s findings can be accounted for by AMT the type of information participants recalled (i.e., central or peripheral) would need to be analysed. Although Hagsand et al. separated participant recall into information units (which included person details, descriptions, actions, and objects); no analyses were highlighted in relation to these details. Consequently, it is not possible to determine how varying degrees of intoxication interact with the type of information recalled. In addition, despite Schreiber Compo et al.'s (2011) research suggesting the need for a placebo when investigating the effects of alcohol on memory, Hagsand et al.'s (2013a) study did not incorporate this condition. Separating the genuine effects of consuming alcohol from the deficits in recall resulting from the mere expectation of alcohol was therefore not possible.

1.3.3.7. La Rooy, Nicol, and Terry (2013).

In one of only two published studies to look at the influence of alcohol on eyewitness memory within the UK, La Rooy et al. (2013) investigated the effects of repeated interviewing on recall. Participants were shown a video of an unsuccessful armed robbery and hostage negotiation after drinking what the researchers termed a low dose (37% vodka dose = Male: 0.2 g/kg; M_{BrAC} = 8.9 g/100ml or M_{BAC} = .02%; Female: 0.17 g/kg; M_{BrAC} = 6.7 g/100ml or M_{BAC} = .01%) or high dose (37% vodka dose = Male: 0.6 g/kg; M_{BrAC} = 32.4 g/100ml or M_{BAC} = .07%; Female: 0.52 g/kg; M_{BrAC} = 30.5 g/100ml or M_{BAC} = .07%) of alcohol, or alternatively a

placebo drink. Twenty minutes after viewing the video participants were asked to write down everything they could remember about the stimuli event. Twenty-four hours later, when sober, participants returned and completed the same recall task as the previous day. Each detail of information provided by participants in the two recall tasks was subsequently coded as either correct or as an error. Across the two recall conditions information was also coded as being consistent, a contradiction, forgotten (recalled in session one but not two) or a reminiscent (recalled in session two but not one).

Analyses indicated a significant increase in the number of errors between the first and second recall attempt but not an increase in total correct recall. However, there was a significant increase in the number of new and accurate details recalled between recall phase one and two. Intoxication, though, did not significantly affect the number of correct details or errors recalled by participants. Further to this there was no interaction between drinking condition and recall attempt for either correct recall or errors. There was also no effect of alcohol dose on the number of recalled details that were consistent, a contradiction, forgotten or a reminiscent, either within or between recall sessions. Additionally, correlational analyses found no relationship between participant BrAC and any of the recall performance measures. Consequently, and in line with the conclusions of Schreiber Compo et al. (2012), low and moderate levels of intoxication were seen to have little to no effect on the amount and accuracy of the information recalled by witnesses. In addition, La Rooy et al.'s (2013) results indicated that witness consistency and reminiscence were unaffected by intoxication, and that some memories for witnessed events were resilient to impairment even with intoxication levels close to the drink drive limit for England, Wales and Northern Ireland. In light of these findings La Rooy et al. concluded that, as with non-intoxicated witnesses, repeated interviewing of witnesses who have consumed alcohol can reveal additional accurate information that was not recalled in the initial interview. As recommended by previous research (Schreiber Compo et al., 2011), La Rooy et al. (2013) included a placebo condition, so as to separate the actual effects of alcohol from the effects of expectation. However, there was no sober/control condition with which to compare the effects of alcohol. La Rooy et al.'s conclusion, that alcohol does not affect either recall accuracy or completeness, could therefore be due to the fact that all participants were either intoxicated or at least believed they had consumed alcohol at the time of encoding. Finally, the aim of La Rooy et al.'s research was to explore how over repeated interviews alcohol effects witness recall. Consequently, as there was no analysis of information type, the study is limited in furthering our understanding of how alcohol affects recall for specific details and AMT.

1.3.3.8. Hildebrand Karlén, Roos af Hjelmsäter, Fahlke, Granhag, and Söderpalm-Gordh (2015).

To investigate the effects of alcohol on an eyewitness' recall for intimate partner violence, Hildebrand Karlén et al. (2015) asked Swedish participants to watch a video depicting a violent argument between a man and woman. Before watching the video, participants had consumed either alcohol (40% vodka dose = 0.7g/kg; Male: M_{BAC} = .07% or Female: M_{BAC} = .08%) or orange juice (control). Ten minutes after viewing the video participants were individually interviewed. From the participant's verbal free recall each piece of new information was coded as correct, incorrect, fabrication or indefinable (subjective evaluations). Recalled details were also classified according to whether they pertained to actions, verbal statements, objects, thoughts/feeling and subjective evaluations. Measures of recall accuracy and completeness were calculated as per Hagsand et al. (2013a).

In terms of recall completeness, whilst intoxicated women reported fewer details than their sober counterparts, no significant difference was found between sober and intoxicated men. This lack of effect in relation to male participants was also found when looking at the type of information recalled. Regarding female participants, however, those who consumed alcohol reported significantly fewer subjective judgements and fewer details of the actions within the video than the sober women. In terms of verbal information, inferred thoughts/feelings and the recall of objects, no significant difference was found between sober and intoxicated women. Regarding the accuracy of participant recall, alcohol was not found to have any effect for either males or females. Ultimately, moderate levels of intoxication at around .07 - .08% reduced the completeness of recall by women but not men, whilst accuracy was unaffected by intoxication for both genders.

Hildebrand Karlén et al.'s (2015) findings, regarding the lack of effect of intoxication on the recall completeness of male participants, contrasts with the findings of Yuille and Tollestrup (1990), where intoxication reduced the completeness of an individual's recall with BACs of .10%. Whilst this lack of effect of intoxication with male participants is consistent with Hagsand et al. (2013a), the negative effect of intoxication on the recall completeness of female participants is not. In terms of accuracy rate, the findings of Hildebrand Karlén et al. (2015) are consistent with those of Hagsand et al. (2013a) and Schreiber Compo et al. (2011) where a high accuracy rate was found when the interview was free recalled. Hildebrand Karlén et al. (2015) therefore conclude that a free recall interview format prompts high accuracy rates for both sober and intoxicated witnesses. With regards to the type of information recalled, Hildebrand Karlén et al. found intoxicated female participants reported fewer actions and subjective judgements than their sober counterparts. This contrasts with

the work of Schreiber Compo et al. (2011) where intoxication resulted in more subjective evaluations and no difference in the number of actions recalled. Hildebrand Karlén et al.'s (2015) finding, that recall accuracy is unaffected by gender, is consistent with the findings of Hagsand et al. (2013a). However, whilst Hagsand et al. (2013a) also found recall completeness to be unaffected by gender Hildebrand Karlén et al. found women who consumed alcohol recalled fewer details than their sober counterparts. Although Hildebrand Karlén et al.'s (2015) findings are largely consistent with previous research; the over-riding forensic issue with this study is that participants were intoxicated when they completed the interview. In real-life, as previously indicated, the police would not knowingly conduct an evidential interview whilst participants are vulnerable due to intoxication (MoJ, 2011). Consequently, concerns regarding forensic relevance are raised.

1.3.3.9. Flowe, Takarangi, Humphries, and Wright (2016).

In the most recent UK study to explore the effects of alcohol on recall, Flowe et al. (2016) asked female participants to complete an interactive hypothetical written sexual assault task in the laboratory. Before reading the scenario, participants consumed either tonic water, or what the researchers referred to as a high (M_{BAC} = .08%) or medium (M_{BAC} = .05%) dose of alcohol (37.5% vodka). Doses were determined individually for each participant based on height and weight. Within each drinking condition participants were told they had consumed either alcohol or a non-alcoholic drink. Due to high drop-out rates, however, interactions between dose and expectancy could not be explored. Within the interactive task participants were asked to identify with the victim and control the level of sexual contact that occurred. When the participant decided sexual contact should cease, they withdrew from the task. Both 24 hours and four months after completing the encoding stage of the study participants completed an online 34 item multiple choice recognition test. Of these items, 25 pertained to central details (perpetrator's appearance, actions and biographical information) and nine related to peripheral information (bystander and physical surroundings). From this test the quantity of information recalled was determined by summing the number of questions answered (i.e., where 'I don't know' was not the response) and dividing this by the total number of test questions. Recall accuracy was measured through overall and report accuracy. 'Overall accuracy' involved dividing the total number of correct responses by the total number of test questions. For 'report accuracy', however, the total number of correct responses was divided by the number of questions answered.

Flowe et al.'s (2016) initial analyses indicated that alcohol did not affect the stage at which women withdrew from the scenario or the length of time it took to complete the task. In terms of information quantity, women in the high dose alcohol condition reported

significantly less information than both the medium dose alcohol and placebo participants. No such difference was apparent between medium dose and placebo participants. In addition, both placebo and intoxicated participants recalled more central than peripheral details, but no interaction between drinking condition and information centrality was apparent. For 'overall accuracy', individuals in the high dose alcohol condition were significantly less accurate than both medium alcohol dose and placebo participants. In regards to 'report accuracy', however, no effect of intoxication was indicated. Whilst 'report accuracy' was significantly lower for peripheral than central information no interaction with drinking condition was apparent. Analyses of retention interval indicated that between the first and second recall attempts both central and peripheral 'report accuracy' decreased, with the latter being more greatly impaired by the delay. Whilst recall accuracy was significantly greater for central than peripheral details at 4 months delay there was no difference at 24 hours. Further exploratory tests indicated that across recall intervals the rate of central information that was forgotten was significantly higher for high alcohol dose than placebo participants. No such effect was apparent for peripheral recall. Regarding 'don't know' responses, drinking condition was not seen to affect the number of such responses given by participants between the two recall attempts for both central and peripheral information.

In terms of alcohol expectancy and AMT, the findings of Flowe et al. conflict with the conclusions of Schreiber Compo et al. (2011). Within the latter study placebo participants reported greater uncertainty, and in support of AMT found intoxicated individuals recalled fewer accurate peripheral details. Flowe et al. (2016) in contrast, concluded that only alcohol dose (and not expectancy) affected the likelihood that a 'don't know' response would be given, and that whilst 'report accuracy' was significantly lower for peripheral than central information no interaction with drinking condition was apparent. For both findings Flowe et al. attribute the discrepancies to the fact that, within their research, intoxicated participants were sober at recall whilst Schreiber Compo et al.'s (2011) participants were still intoxicated. Flowe et al.'s (2016) findings, that higher levels of intoxication impair the quantity of details recalled, are in line with the research of Hildebrand Karlén et al. (2015, females only) and Yuille & Tollestrup (1990) where intoxication reduced recall completeness. Flowe et al.'s (2016) lack of effect of intoxication on 'report accuracy' supports the previous findings of Schreiber Compo et al. (2012), Hagsand et al. (2013a), Hildebrand Karlén et al. (2015), and La Rooy et al. (2013) and extends these conclusions to a negative emotional event.

Whilst Flowe et al.'s (2016) findings are in general accordance with previous research; there are two main forensic concerns with this study. Firstly, participant recall was assessed through a multiple-choice recognition test, rather than being based on free recall as

experienced by real-world witnesses and victims. Previous intoxicated witness studies have suggested that alcohol affects an individual's recall when assessed though free recall (Harvey et al., 2013a), but not a recognition test (Harvey et al., 2013b). It is therefore possible that the findings in this study are a consequence of the recall method that was employed and consequently transferring these findings to real-life may be problematic. Secondly, all participants were female and completed the task from the position of a victim. From a forensic perspective, as indicated by Flowe et al. (2016) women are disproportionately affected by sexual assault (Fisher, Cullen, & Turner, 2000). National statistics, though, indicate that for offences such as robbery and violent crimes, the victim at least, is just as likely to be male (ONS, 2014). Research which seeks to explore the effects of alcohol on recall and to examine AMT should therefore seek to include both male and female participants.

1.3.3.10. Hagsand, Roos af Hjelmsäter, Granhag, Fahlke, and Söderpalm-Gordh (2016).

In the most recent study to look at the effects of alcohol on eyewitness recall Hagsand et al. (2016) asked Swedish participants to watch a video of a woman being kidnapped (per Hagsand et al., 2013a) after drinking either alcohol (40% vodka dose = Male: 0.70 g/kg; Female: 0.65 g/kg; M_{BAC} = .05%) or orange juice (control). Fifteen minutes after viewing the video, whilst still intoxicated, half the participants completed a verbal free and cued recall interview. A week later, in a separate location, all participants returned to complete the same interview as in phase one. From the participants' free and cued recall, each new piece of information was coded as a person detail, description, action or object. Each detail was also coded as correct or incorrect. Accuracy rate was determined as per Hagsand et al. (2013a). Details were also coded as consistent (recalled in phase one and two), omitted (recalled in phase one but not two), reminiscent (recalled in phase two but not one) or contradictory (recalled in phase one but changed in phase two).

Initial analyses indicated that whilst there was no effect of intoxication on the number of details recalled, participants did recall more details in the immediate than in the delayed interview, irrespective of drinking condition. Within the free recall task intoxicated participants recalled fewer details than those who were sober. For the cued recall part of the interview though no difference was indicated between the two drinking conditions. In terms of accuracy, as with the number of details recalled, no effect of intoxication was apparent and immediate recall was more accurate than delayed recall. However, participants were more accurate during the free rather than the cued recall element of the interview, but there was no interaction with drinking condition. Further analyses on the number of details recalled consistently between recall phase one and two and the accuracy of these details also indicated no effect of intoxication.

Hagsand et al.'s (2016) conclusion, that low levels of intoxication do not affect the accuracy of an eyewitness' recall, is consistent with the vast majority of the previous eyewitness studies that have been discussed and have achieved low to moderate levels of intoxication (Flowe et al., 2016; Hagsand et al., 2013a; Hildebrand Karlén et al., 2015; La Rooy et al., 2013; Schreiber Compo et al., 2012). Further to this the lack of a main effect of intoxication on the quantity of details recalled within Hagsand et al.'s (2016) research is also consistent with some of the previous studies that have already been discussed (Hagsand et al., 2013a; Hildebrand Karlén et al., 2015 (males only); La Rooy et al., 2013; Schreiber Compo et al., 2012). However, Hagsand et al.'s (2016) conclusion that alcohol has a negative effect on the quantity of details recalled in the free, but not the cued, elements of the interview conflicts with the findings of Schreiber Compo et al. (2012) where no effect of intoxication was apparent in either task. The interaction between drinking condition and recall method, Hagsand et al. (2016) suggest, may be due to fragmentary blackouts as a result of alcohol consumption. These blackouts, the authors indicate, may have made free recall more difficult whilst the cues from the cued recall task assisted participant recall. From a forensic perspective, as with Hagsand et al.'s previous research (Hagsand et al., 2013a), the present study did not include a placebo condition in order to separate the effects of intoxication from the effects of expectation. In addition, although the study separated participant recall into information type no analyses were highlighted in relation to these details. Consequently, it is not possible to determine how varying degrees of intoxication interact with the type of information recalled.

A summary of the methodological details, power and key findings of the past studies discussed in section 1.3.3. (Recall of eyewitnesses) can be found in Table 1.5.

Table 1.5: A Summary of Previous Alcohol and Eyewitness Memory Studies and their Main Findings

Authors	Dose/BAC/ Consumption time	Recall Characteristics	Setting/ Crime	Power	Recall Quantity/ Completeness	Recall Accuracy	Central Recall	Peripheral Recall
Harvey et al. (2013a)	Dose: 0.6ml/kg ethanol BAC: .06% Time: 1 drink in 10 mins Condition: Sober, Alcohol	Verbal free recall interview; 24 hours delay; Same context as encoding	Lab; One high or low emotional salient static image; Eye-tracker	0.53 to 0.98	Negative effect of alcohol ($\eta p^2 = .33$)	N/A	No interaction between alcohol & information type ($\eta p^2 = .01$)	
Harvey et al. (2013b)	Dose: 0.6ml/kg ethanol BAC: .12% Time: 1 drink in 10 mins Condition: Sober, Alcohol	True/false recognition test; 24 hours delay; Same context as encoding	Lab; Series of static images of theft; Eye-tracker	0.19	N/A	No effect of alcohol	No interaction between alcohol & information type ($\eta p^2 = .01$)	
Yuille & Tollestrup (1990)	Dose: 1.32ml/kg ethanol BAC: .10% Time: 3 drinks in 30 mins Condition: Sober, Placebo, Alcohol	Standard police interview; Immediate & 1 week delay or delay only; Unclear whether same context as encoding	Lab; Witness to live staged theft; males only		Negative effect of alcohol	Small negative effect of alcohol	N/A	N/A
Schreiber Compo et al. (2011)	Dose: 2.35-2.82 ml/kg vodka BAC: .08% Time: 3 drinks in 30 mins Condition: Sober, Placebo, Alcohol	Written free recall with Cognitive Interview elements; Immediate recall; Different context to encoding	Lab; Interaction with bartender	0.48 to 0.56	No effect of alcohol ($\eta p^2 = .00$) Placebo more dont knows ($\eta p^2 = .06$)	N/A	No effect of alcohol on accurate recall ($\eta p^2 = .00$)	Negative effect of alcohol on accurate but not inaccurate recall

Table 1.5: (cont.)

Authors	Dose/BAC/ Consumption time	Recall Characteristics	Setting/ Crime	Power	Recall Quantity/ Completeness	Recall Accuracy	Central Recall	Peripheral Recall
Schreiber Compo et al. (2012)	Dose:2.35-2.82 ml/kg vodka BAC: .08% Time: 3 drinks in 30 mins Condition: Sober, Placebo, Alcohol	Verbal open, cued & mixed free recall interview; Immediate recall; Different context to encoding	Lab; Witness to live staged theft	0.21 to 0.26	No effect of alcohol ($\eta p^2 = .03$)	No effect of alcohol ($n = .04$)	N/A	N/A
Hagsand et al. (2013a)	Dose: 0.4 g/kg; 0.7 g/kg vodka BAC: .04% and .06% Time: 1 drink in 15 mins Condition: Sober, Low dose, High dose	Standard open-ended question interview; 1 week delay; Different context to encoding	Lab; Witness' view of videoed kidnapping	0.26 to 0.70	Negative effect of alcohol for high dose v low dose ($\eta p^2 = .06$) & high dose v (control & low dose combined) ($\eta p^2 = .02$)	No effect of alcohol ($\eta p^2 = .02$)	N/A	N/A
La Rooy et al. (2013)	Dose: 0.17-0.20g/kg Vodka; 0.52-0.60 g/kg vodka BAC: .01-.02% and .07% Time:1 drink in 15 mins Condition: Placebo, Low dose, High dose	Written free recall; Immediate & 24 hour delay; Same context as encoding for recall one but recall two unclear	Lab; Witness' view of videoed armed robbery & hostage negotiation	0.14 to 0.21	No effect of alcohol ($\eta p^2 = .03$)	No effect of alcohol	N/A	N/A

Table 1.5: (cont.)

Authors	Dose/BAC/ Consumption time	Recall Characteristics	Setting/ Crime	Power	Recall Quantity/ Completeness	Recall Accuracy	Central Recall	Peripheral Recall
Hildebrand Karlén et al. (2015)	Dose: 0.7 g/kg vodka BAC: .07 - .08% Time: 1 drink in 15 mins Condition: Sober, Alcohol	Verbal free recall interview; Immediate recall; Same context as encoding	Lab; Witness' view of videoed intimate partner violence	0.10 to 0.41	Female - negative effect of alcohol ($\eta p^2 = .10$) ; Male - no effect of alcohol ($\eta p^2 = .01$)	No effect of alcohol ($\eta p^2 = .01$)	Females- negative effect of alcohol on recall of actions & subjective judgements ($\eta p^2 = .22$) not verbal info or objects; Males - No interaction between alcohol and information type ($\eta p^2 = .05$)	
Flowe et al. (2016)	Dose: by height /weight vodka BAC: .05% and .08% Time: 3 drinks in 15 mins Condition: Placebo, medium dose, high dose	Online multiple choice recognition test; 24hr & 4 month delay; Different context to encoding	Lab; Sexual assault choice paradigm; Witness perspective; Women only	0.80 to 0.97	Negative effect of high dose compared to medium dose & placebo ($\eta p^2 = .21$)	No effect of alcohol on 'report' accuracy. Negative effect on 'overall' ($\eta p^2 = .14$)	No interaction between alcohol and information type for report accuracy or quantity of details recalled.	
Hagsand et al. (2016)	Dose: 0.65-0.70 g/kg vodka BAC: .05% Time: 1 drink in 15 mins Condition: Sober, Alcohol	Verbal free & cued recall; Immediate & 1 week delay or delay only; Same context as encoding for recall one but not two	Lab; Witness' view of videoed kidnapping	0.91	No effect of alcohol but for free recall alcohol recalled fewer details ($\eta p^2 = .14$) but no difference for cued recall	No effect of alcohol	N/A	N/A

1.4. Methodological Issues

As can be seen from the alcohol and eyewitness research discussed in section 1.3.3 (Recall of eyewitnesses), a number of different methodologies have been employed when studying eyewitness recall, administering alcohol to participants and also when coding/interpreting recall. Each of these variables has the potential to influence the conclusions that the researchers draw and will therefore be discussed.

1.4.1. Eyewitness research methods.

In the late 1970's Wells (1978) distinguished between two groups of variables that may affect the accuracy of an eyewitness' testimony or identification performance: system and estimator variables. System variables pertain to the retrieval stage of a witness' memory and concern those factors that the Criminal Justice System has control over, for example, how officers choose to interview the witness (e.g., Krix et al., 2016) or the identification procedures adopted (e.g., Davis, Valentine, Memon, & Roberts, 2015). Estimator variables, however, pertain to the encoding and storage of witness memories and concern details that the Criminal Justice System does not have control over. This includes characteristics of the event and the witness, such as environmental factors at the time of the crime (e.g., length of exposure; Carlson et al., 2016), or a witness' age (e.g., Toglia, Ross, Pozzulo, & Pica, 2014), mental capabilities (e.g., Maras & Bowler, 2014) or intoxication (e.g., Hagsand et al., 2016).

The eyewitness literature that investigates these system and estimator variables is primarily dominated by laboratory based experimental methods, as seen in the alcohol and eyewitness research that has been discussed (see section 1.3.3. Recall of eyewitnesses). Due to the ability to systematically manipulate variables and to randomly assign participants to conditions this methodology enables researchers to look at the cause-effect relationships between variables (Wells & Quinlivan, 2009). The ecological validity of this research method, however, depends greatly on the stimuli event that the witness is exposed to (Yuille, Ternes, & Cooper, 2010). Whilst some researchers show slides to witnesses (Harvey et al., 2013a, 2013b), others have used a staged live crime (Schreiber Compo et al., 2012; Yuille & Tollestrup, 1990). Possibly the most frequently used means of presenting witnesses with a to-be recalled crime is through a videoed stimuli event, as the costs in terms of time and money are not as high as with a live event (Yuille et al., 2010). As is the case with this thesis, ensuring that all participants are exposed to the same stimuli event in order to reduce confounding variables can also lead researchers to adopt this research method (Chae, 2010). Further to this, as within this thesis, ethical requirements may restrict the use of a live event due to potential concerns for participant and researcher safety, especially if the witness is intoxicated. Previous research, however, suggests that a videoed event can still incorporate

the key aspects of a genuine crime, which are important when studying the recall of an eyewitness (Ihlebæk, Løve, Eilertsen, & Magnussen, 2003). In addition, within the eyewitness literature, it is usually undergraduates that take on the role of the witness or victim. Although this participant demographic has been criticised by prosecutors (see Wilford & Wells, 2013), researchers (Cutler & Wells, 2009) indicate that there is no reason to suppose that the memory processes of undergraduates are fundamentally different from those of the general public, aside from age-related issues (Toglia et al., 2014). In light of this, and to also address potential concerns regarding researcher and participant safety, undergraduates will participate in the majority of the studies conducted within this thesis.

1.4.2. Achieving specific blood and breath alcohol concentrations.

The typical paradigm employed in alcohol research involves administration of a single or multiple doses of alcohol consumed within a maximum of 30 minutes (e.g., Duka & Townshend, 2004; Grattan-Miscio & Vogel-Sprott, 2005; Saults, Cowan, Sher, & Moreno, 2007). According to the NIAAA (1995) there are typically three alcohol dose ranges used in such research. When a BAC of up to .05% (BrAC: 0.22mg/100ml) is achieved a low dose of alcohol was initially consumed, whilst a BAC of between .06% (BrAC: 0.26mg/100ml) and .15% (BrAC: 0.66mg/100ml) indicates a medium dose. A BAC above this level consequently signifies that a high dose of alcohol has been consumed. The resulting BAC, however, is dependent on a wide range of factors as already indicated (see section 1.2.5. Neurophysiological effects of intoxication), but is primarily affected by the type of alcoholic drink consumed. On average, an individual's liver can metabolise one unit of alcohol an hour so the greater the difference between absorption and metabolism rate the higher the resulting BAC will be (Brouwer, 2004). As a consequence, any factor that escalates the absorption rate of alcohol into the blood or decreases metabolism, will increase the BAC of that individual (see section 1.2.6. Blood alcohol and legal intoxication).

Determining the appropriate alcohol dose necessary to achieve a specific BrAC or BAC is therefore a complex process and even the numerous protocols that have been successively developed (Breslin, Mayward, & Baum, 1994; Jones & Jönsson, 1994; Lin, Weidler, Garg, & Wagner, 1976; Mundt, Perrine, & Searles, 1997; Thomasson, 1995) to accomplish this are not always consistent in the accuracy of the alcohol concentrations they produce (Finnigan & Hammersley, 1992; Friel, Baer, & Logan, 1995; Mundt et al., 1997; Thomasson, 1995). Within laboratory based alcohol research though, ethanol doses of 0.2ml/kg (Duka & Townshend, 2004; Liguori, Gatto, & Jarrett, 2002; Milani & Curran, 2000; Mintzer & Griffiths, 2001), 0.4ml/kg (Abroms, Gottlob, & Fillmore, 2006; Bartholow et al., 2003; Bisby, Leitz, Morgan, &

Curran, 2010), 0.6ml/kg (Abroms et al., 2006; Garfinkel et al., 2006; George, Rogers, & Duka, 2005; Leitz, Morgan, Bisby, Rendell, & Curran, 2009; Mintzer & Griffiths, 2001; Paraskevaides et al., 2010; Schweizer, Vogel-Sprott, Dixon, & Jolicœur, 2005), and 0.8ml/kg (Bartholow et al., 2003; Bisby et al., 2010; Duka et al., 2001; Tracy & Bates, 1999; Weissenborn & Duka, 2000) are typically administered to produce the alcohol condition. A few studies have also administered ethanol doses above 0.9ml/kg (e.g., Moulton et al., 2005; Söderlund et al., 2005). In some cases, alcohol (usually in the form of vodka) is administered in the place of ethanol. In these instances, higher doses are given to participants due to the lower % ABV of vodka compared with ethanol (Finn, Justus, Mazas, & Steinmetz, 1999; Hashtroudi et al., 1984; Hernández, Vogel-Sprott, Huchín-Ramirez, & Aké-Estrada, 2006; Kirchner & Sayette, 2003; Maylor, Rabbitt, & Kingstone, 1987; Millar, Hammersley, & Finnigan, 1992; Saults et al., 2007). In addition, to aid in achieving specific BACs and to ensure participant safety, weight restrictions may be imposed on those in the alcohol condition. For example, within Harvey et al. (2013a, 2013b) alcohol participants were weighed to ensure only those between 55 and 95kg took part. Such restrictions are imposed to protect participants due to the fact that individuals under the minimum weight may be at risk of acute alcohol intoxication, where too much alcohol is consumed too quickly which can lead to symptoms ranging from slurred speech to death (Vonghia et al., 2008). In contrast, for those individuals who weigh above the maximum weight, the alcohol doses that are typically employed within laboratory research may not be sufficient to attain a suitable BAC level which is comparable to those individuals of lower weight.

1.4.3. Alcohol Expectancy and Placebo Effect.

When one event or behaviour is continually succeeded by another an individual quickly learns the association between the two. Soon there is an expectation that event two will always follow event one (Tolman, 1932). When the learned association is sufficiently strong this expectancy alone can produce the second event without event one necessarily being present (Kirsch, 1999). It is this that forms the central tenet of expectancy theory (Vroom, 1964) which indicates that a person will act in a certain way or take a certain course of action because of the anticipated outcomes associated with it. For example, when alcohol is expected but a placebo of a simple tonic is consumed, research indicates a person can be more aggressive (Lang, Goeckner, Adesso, & Marlatt, 1975) or break out into spontaneous laughter (Vuchinich, Tucker, & Sobell, 1979). As a result, the mere expectation that alcohol has been consumed can be sufficient to produce the social and affective behaviours (George & Marlatt, 1986; Lansky & Wilson, 1981; Wilson & Lawson, 1976) typically associated with

intoxication and this is referred to as the Placebo Effect. Research indicates, however, that expectancy effects are not typically evident with more cognitive tasks and non-social behaviours (e.g., Assefi & Garry, 2003; Clifasefi, et al., 2006; Hilliar, Kemp, & Denson, 2010; Hull & Bond, 1986; Schulte, Müller-Oehring, Strasburger, Warzel, & Sabel, 2001).

To isolate the effects of expectation from the true effects of intoxication the placebo is characteristically included in laboratory alcohol research (e.g., Bartholow et al., 2003; Clifasefi et al., 2006; Flowe et al., 2016; Garfinkel et al., 2006; La Rooy et al., 2013; Schreiber Compo et al., 2011; Schreiber Compo et al., 2012; Yuille & Tollestrup, 1990). In such a scenario participants consume a beverage that has an appearance and odour near identical to that of an alcoholic drink although it contains little to no alcohol. With participants believing they are drinking alcohol and hence to some degree are intoxicated, any difference in their behaviour or actions, compared with the knowingly sober participants, will be the result of the mere expectation of alcohol's effects rather than as a consequence of the actual experimental manipulation. Alternatively, a balanced placebo design (Marlatt & Rohsenow, 1980) may be applied, whereby participants are told that they have consumed an alcoholic or non-alcoholic beverage with this information being either true or false. Achieving a plausible placebo though is one of the fundamental issues with alcohol research (Rohsenow & Marlatt, 1981) as alcohol has a very distinct smell, taste and appearance of which drinkers are well aware.

With researchers facing the challenge of delivering a credible placebo, a variety of different techniques have been applied to create the illusion of an alcoholic beverage within the placebo group. Masking techniques typically involve the use of a strong tasting component such as Tabasco sauce (Leitz et al., 2009; Weissenborn & Duka, 2003) or Minute Maid crystals mixed with peppermint extract (Söderlund et al., 2005). In terms of generating a placebo beverage a 'floater' of alcohol is typically placed on top of the non-alcoholic liquid to immediately simulate the smell and taste associated with alcohol (Fillmore & Vogel-Sprott, 1995; Harvey et al., 2013a, 2013b; La Rooy et al., 2013; Read et al., 1992; Yuille & Tollestrup, 1990). Repeated breathalysing, a strong smell of alcohol within the vicinity, and witnessing their drink being poured from an alcohol bottle all seek to reinforce the participants' misconception of alcohol consumption. These measures, however, can only go so far in misleading individuals and are not sufficient to simulate the consumption of high alcohol dosages (Martin, Earleywine, Finn, & Young, 1990); neither do participants typically report being as intoxicated as those in the alcohol condition (Maisto, Carey, Carey, & Gordon, 2002; Marczinski & Fillmore, 2005; Schreiber Compo et al., 2012).

With placebo and alcohol conditions, if participants believe themselves to be intoxicated to different extents, then the two conditions may not be as comparable as intended. The more intoxicated an individual believes themselves to be, the greater the deficits they would expect (Wall, McKee, & Hinson, 2000), which may in turn affect the type of behaviours that are produced. The replacement of the placebo condition with a low alcohol dose group is therefore sometimes used to investigate the effect of higher alcohol consumption (Dougherty et al., 1999; Liguori et al., 2002; Verster et al., 2009). Alcohol studies using a placebo condition have indicated that these participants demonstrate many of the behavioural changes (Hull & Bond, 1986; Marlatt & Rohsenow, 1980), impairments (Fillmore, Carscadden, & Vogel-Sprott, 1998) and subjective feelings of intoxication (Assefi & Garry, 2003; Mckay & Schare, 1999) communicated by alcohol participants.

Research indicates that the consumption of a placebo may increase an individual's aggressiveness (Dermen & George, 1989; Zhang, Welte, & Wieczorek, 2002), slow reaction times (Finnigan, Hammersley, & Millar, 1995), increase sexual risk-taking (Fromme, D'Amico, & Katz, 1999) or lead the individual to make use of a different (more liberal) criterion for the acceptance of post-event information (Assefi & Garry, 2003). The belief that an individual has consumed alcohol can also result in compensatory behaviour, such as hyper-vigilance to negate the weaker performance that is anticipated (Fillmore & Blackburn, 2002; Marczinski & Fillmore, 2005; Testa et al., 2006). Ultimately, the value of incorporating an alcohol placebo depends on the effectiveness of the procedure and the level of intoxication attempting to be mimicked.

Consequently, within this thesis, participants in the placebo condition drank pure lemonade with 5ml of ethanol floating on the top. The rim of the glass was also spritzed with a 50:50 mixture of ethanol and water. This placebo procedure, with either orange juice or lemonade, was the method validated and seen to be effective in previous research (Fillmore & Vogel-Sprott, 1995; Harvey et al., 2013b; La Rooy et al., 2013; Read et al., 1992; Yuille & Tollestrup, 1990). The placebo condition, rather than a low dose alcohol condition was employed to clearly separate the true effects of alcohol from the effects of the mere expectation of consuming alcohol. In addition, as Hull and Bond's (1986) meta-analysis indicated no interaction between the physiological and psychological effects of intoxication on memory, and concluded that only half of a balanced placebo design (Marlatt & Rohsenow, 1980) need be run by researchers, a placebo rather than a balanced placebo design will be run in this thesis.

1.4.4. Experimental Power.

As can be seen in table 1.5, much of the previous alcohol and eyewitness studies have obtained small/medium effect sizes (ηp^2 = .00 to .33; $M\eta p^2$ = .07). The sample sizes that have been employed, however, have been insufficient to obtain statistical power of at least the recommended .80 level (Cohen, 1988). Within this thesis, priori power analyses will therefore be employed to ensure that the sample sizes attained are large enough to attain the recommended power of .80 for a medium effect (ηp^2 = .06) (f = .25, α = .05; Cohen, 1988).

1.4.5. Alcohol Myopia Theory.

As discussed in section 1.3.2 (Alcohol Myopia: Theory of intoxication) AMT states that the range of cues an individual can perceive when intoxicated is restricted due to a disproportionate amount of attention being given to immediate salient cues. Subsequently, weaker less salient cues receive less attention.

1.4.5.1. Salience.

AMT stresses that it is the salience of the information or details available to an intoxicated individual that determines the extent to which attentional resources are allocated to an item. In a direct test of this basic tenet of AMT as mentioned earlier, Harvey et al. (2013a) employed the use of an eye-tracker to follow the eye movements of both sober and intoxicated (M_{BrAC} = 0.28mg/L) individuals when viewing high and low salient scenes. Salience within this research was classified as the emotional prominence of the event. The highly salient static image showed a violent altercation between police officers and protesters. The low salience image in contrast showed the emotionally uninvolved scenario of two buskers. Each participant was exposed to the images for 10 seconds and instructed to look at the stimulus as freely as they would in the real-world. A day later participants returned to complete a recall task. The subsequent analysis indicated that although the intoxicated individuals' foveal attention was focused more upon the central rather than the peripheral area of both the high and low salient image, this did not aid their recall for these details. This focus on details at the centre of the visual display, Harvey et al. indicate, is consistent with AMT's attention-narrowing explanation and extends the theory from its original assertions made in relation to social behaviour to also encompass visual attention.

In Harvey et al.'s (2013a) research high and low salience was determined by the emotional involvement of the participant with the image. The main event in both of these images was in the spatial centre of the scene. Semantic relevance was also determined to correspond to these locations. As a result, within the middle of the images, both the semantic

and the spatial definition of centrality were incorporated. According to AMT, however, it is the internal and external cues that become most noticeable or important to the intoxicated person during the event that determines their salience rather than the nature of the item itself. As such, salience cannot be restricted to situations where both semantic and spatial centrality, correspond to one specific, static location. Also from a forensic perspective, due to the complex nature of a real-life crime it is unlikely for semantic and spatial salience to continually coincide in one location. Despite this, research has deemed highly salient details to refer to central items whilst low salience refers to peripheral elements (Flowe et al., 2016; Schreiber Compo et al., 2011; Schreiber Compo et al., 2012; Van Oorsouw & Merckelbach, 2012).

1.4.5.2. Central and peripheral classification.

With researchers defining the salience of an internal or external cue by referring to the centrality or otherwise of an item, it is necessary to determine how to conceptualise centrality and what constitutes a central and a peripheral element of an event. The construction of exactly what these two variables actually encompass, does in turn, have a significant impact on the results that are produced and the conclusions that can be drawn. Since the early work of Loftus (1979) though there has been very little empirical and operational consensus on what is meant by the central or peripheral details of an event.

As a result of the lack of agreement with regards to the definition of these constructs, a plethora of methods have been developed to conceptualise centrality (see Reisberg & Heuer, 2004, for a review). One such method is a semantic definition whereby researchers have chosen to focus on the importance of an element to the unfolding event in order to determine the centrality of that information (Dalton & Daneman, 2006; Schreiber Compo et al., 2012; Talarico, Berntsen, & Rubin, 2009). Through this definition central elements are those that are key to the event, or those details that could not be changed or eliminated without the basic story changing substantially. Peripheral items in contrast would not affect the overall event if they were changed or excluded (Burke, Heuer, & Reisberg, 1992; Heath & Erickson, 1998). Other researchers, however, have adopted a spatial or visual definition of centrality, whereby a central item is deemed to be a detail that is physically central to the event or the individual's visual display (Christianson & Loftus, 1991; Harvey et al., 2013a; Wessel, De Kooy, & Merckelbach, 2000). A peripheral element is therefore a detail that is on the periphery of the event or the individual's field of vision. Researchers have also classified details as central or peripheral based upon a thematic definition (Flowe et al., 2016; Harvey et al., 2013b; Heuer & Reisberg, 1990; Schreiber Compo et al., 2011; Van Oorsouw & Merckelbach, 2012). From the forensic memory work of Loftus (1979), central elements of an

event were referred to as major details and denoted information about clothing and actions of the central characters in the scenario. Minor or peripheral details in contrast were elements of the surrounding environment: buildings and traffic for example. This classification, however, essentially ignores the relevance of the details to the plot when determining centrality. For example, the main character wearing a jumper would be deemed central although it may not be pertinent to the entire story.

Due to the many definitions of centrality, coupled with the individual nature of each event, even when a single classification is used, a range of conclusions are produced as to the extent to which central and peripheral information is differentially recalled. This type of recall is therefore not a stable phenomenon. Steele and Josephs' (1990) definition of salience, however, does not consider only spatial location, semantic meaning, or relevance to the plot/individual. These strict classifications are too simple to fully encompass the basic tenet of Steele and Josephs' AMT; after all, it is salience and not centrality that the theory considers. Consequently, salience needs to take into account not only spatial location but also semantic meaning. Incorporating each of these aspects should ensure that it is the salience of each detail that is being studied not just their centrality. It is the intention of this thesis to use this more encompassing definition of salience, where spatial location and semantic meaning are considered, in order to assess the validity of applying Alcohol Myopia Theory to the recall of intoxicated witnesses.

1.5. Overview of the Empirical Work in this Thesis

Initially, within this thesis, the extent to which witness intoxication is prevalent in England will be determined. It is the aim of this research to then explore how alcohol affects the recall of an eyewitness, and whether particular details are more susceptible to any impairment from intoxication. This thesis will also investigate whether these memory deficits can be countered through the interview techniques that are employed. Finally, the credibility of intoxicated witnesses will be considered from the perspective of jurors. With respect to the empirical research, there are six studies reported in this thesis. The purpose of the first study was to establish the extent to which intoxicated witnesses are a frequent occurrence in England. This initial study (chapter 2) examined not only frequency but how officers interact and interview such witnesses. Studies 2a, 2b and 3 explicitly investigated the effects of intoxication on the recall of high and low salient information. Studies 2a (chapter 3) and 2b (chapter 4) tested the hypothesis that alcohol would impair the recall of participants, with details of both low spatial and semantic salience suffering the greatest impairment as predicted by AMT. Study

2a employed an alcohol dose of 0.6ml/kg whilst study 2b increased this dose to 0.8ml/kg. Both studies employed the same laboratory based procedure.

Study 3 (chapter 5) employed a more ecologically valid methodology with real-world levels of intoxication and participants taking part during their night out in the Student Union. As with studies 2a and 2b, study 3 examined the hypothesis that higher BACs at encoding would result in greater impairments in the memory of stimuli event details when recalled sober. In line with AMT, it was predicted that this deficiency would be greatest for low salience elements. The purpose of study 4 (chapter 6) was to investigate whether the Enhanced Cognitive Interview (ECI), as used by police officers in England and Wales, had the capacity to improve the recall of an intoxicated witness when compared to the Structured Interview (SI). It was hypothesised that the ECI would aid recall and that higher levels of intoxication would reduce recall completeness but not accuracy. In addition, it was hypothesised that intoxication would result in particularly impaired recall for surrounding details. Using interviews from study 4, study 5 (chapter 7) examined the effect witness intoxication had on the credibility of the witness as determined by mock juror participants. It was hypothesised that those witnesses with higher levels of intoxication would be seen as less credible than sober witnesses.

Chapter 2: Study 1: Police Officers Perceptions of Intoxicated Eyewitnesses

Abstract

Despite the apparent role alcohol plays in criminal offences, there is at present no evidence available as to the extent of the problem of intoxicated witnesses within England. To address this lack of research police officers from seven constabularies completed an online survey addressing issues such as the prevalence of intoxicated witnesses, how officers determine intoxication, the procedures that are employed and their effectiveness, and how officers interview witnesses who have consumed alcohol. Officers indicated that intoxicated witnesses were a common, to very common, occurrence with most officers determining intoxication through physical symptoms and the witness's own admission. In terms of interviewing witnesses the majority of officers indicated that initial details were taken from witnesses whilst they were intoxicated but the evidential interview was taken when sober. Officers also indicated that if the witness was intoxicated then the case was less likely to proceed to court and that officers viewed the witness as less accurate. These findings are considered from a criminal justice perspective and discussed in relation to future research.

2.1. Introduction

Alarmingly as alcohol consumption increases so does the probability of being targeted by criminals (Touhig, 1998). In 2015/16, around 1.3 million violent crimes were committed in the UK, with around half of these offences involving a perpetrator who had consumed alcohol (ONS, 2016). A similar link between alcohol and violent crime can be seen across Europe (Anderson & Baumberg, 2006) particularly in Ireland, Germany and the Nordic countries (Mäkelä et al., 1999; Ramstedt & Hope, 2005; Rossow & Hauge 2004; Rossow, Pernanen, & Rehm, 2001). International research also indicates that in many instances where the perpetrator is intoxicated, the victim and witness are also under the influence of alcohol (Van Dijk, 2007). Yet despite the apparent role alcohol plays in criminal offences, the only evidence available as to the extent of witness intoxication is in relation to crimes committed in North America (Evans et al., 2009; Palmer et al., 2013), or anecdotal evidence from Canadian law enforcement officers (Yuille, 1986).

According to North American and Canadian officers, intoxicated witnesses are a widespread problem. In a survey of 119 North American police officers, around 73% indicated that interacting with intoxicated witnesses was a common occurrence, with such witnesses having an estimated BAC of 0.11ml/kg or .11% (Evans et al., 2009). Of those witnesses deemed to be under the influence of a substance, officers indicated approximately 58% had consumed just alcohol whilst a further 24% were thought to be intoxicated from multiple substances. Furthermore, an archival analysis of 639 felony criminal cases (rape, robbery and assault) in the South West United States found around 20% of cases had at least one intoxicated witness (Palmer et al., 2013). Of the 170 witnesses under the influence of a substance, 73% had consumed only alcohol whilst another 11% had taken a combination of drugs, potentially including alcohol. Such findings suggest that alcohol is likely to be the most common drug that officers will encounter when dealing with witnesses. When it comes to testifying in court 49.4% of US police officers indicated that intoxicated witnesses were less likely to testify (Evans et al., 2009). However, an archival analysis found intoxication not only had no effect on whether charges were filed, but that about a third of witness testimonies heard in North American courts were from individuals under the influence of alcohol (or another drug) at the time of the crime (Palmer et al., 2013).

In the UK, intoxicated witnesses have been largely overlooked by researchers (Malpass et al., 2008). As such it is unsurprising that very few guidelines have been produced to aid police officers and courts in dealing with such individuals. In England and Wales if the Crown Prosecution Service presents the evidence of an eyewitness which a defendant disputes, then the court will follow the Turnbull Guidelines (*R v Turnbull, 1976*). These

guidelines are to assist in cases where the defendant claims the witness has made a mistake in their identification of the suspect, but can be applied to all aspects of a witness' recall. In such circumstances, to provide the jury with a strong indication as to how much reliance can be placed on the witness' identification, the judge takes into account not only witness demeanour and account consistency (Bingham, 2006) but also a range of estimator variables (Wells, 1978). These estimator variables can include the intoxication of the witness although it is not specifically referred to. In light of the Turnbull Guidelines police officers are trained to describe in their accounts how much the witness had drunk. Without other guidelines or legal backing, it is left to each officer to determine the witness' degree of intoxication.

In their survey of North American police officers Evans et al. (2009) found that 71.4% of respondents did not use an instrument such as a breathalyser to determine the intoxication of the witness, instead gauging intoxication through behavior, odour or a sobriety test (such as the walk-and-turn or the one leg stand). This is supported by Palmer et al.'s (2013) archive analysis where, in only 9% of cases, the intoxication of the witness was determined by a breathalyser, with a further 3% being observed consuming alcohol. In an overwhelming 88% of criminal cases though, it was the witness admitting having consumed alcohol or drugs that allowed police officers to establish intoxication. This evidence indicates that at least in North America, an officer's experience and the witness' self-confessed consumption of alcohol are the primary means of assessing intoxication. With no research, having been conducted in England and Wales, there is no indication of how police officers choose to determine witness intoxication and how consistently this is done. If, as in Canada, this information is not consistently documented (Yuille & Tollestrup, 1990), then the worth and reliability of such evidence, when provided to the court, may be bought into question.

The lack of legal and practical guidelines for police officers in the UK is not limited to only how to determine, measure and quantify witness intoxication, but also what procedures officers should follow when interviewing a witness who has consumed alcohol. Does an officer follow the same procedure as used with a sober witness? Do they treat the intoxicated witness as part of a vulnerable group (e.g., as with children or those with learning disabilities) and alter the interview process accordingly? If so what changes are made? In North America, 74% of law enforcement officers indicated that whether they interview a witness whilst still intoxicated depended on the situation (Evans et al., 2009). While 44.2% of officers said they followed the same procedure whether the witness was drunk or sober, 45.5% claimed they altered their typical interview procedure if the witness was intoxicated. The most common alteration indicated by officers was to interview the witness immediately, despite them being intoxicated, then conduct a follow-up interview once sober. Palmer et al.'s (2013) archive

analysis provides some support for this with 72% of officers obtaining a witness description of the perpetrator on the same day as the offence rather than the next, although no details were given as to whether a follow-up interview was conducted once sober. Other than this, Palmer et al. (2013) concluded that officers treat sober and intoxicated witnesses similarly when information gathering. Without specific guidelines, and with no research conducted in England and Wales, questions as to what procedures officers actually follow when dealing with intoxicated witness are at present unanswered. The aim of the present study was therefore to begin to address the lack of research in England and Wales as to how frequently police officers have to deal with intoxicated witnesses, the extent of their involvement in criminal cases, and the procedures officers follow when interviewing such individuals. To this end a questionnaire based on the work of Evans et al. (2009) was constructed. As this was exploratory research no hypotheses were put forward.

2.2. Method

2.2.1. Participants.

In order to allow police forces from a range of geographical locations within England and Wales to complete the questionnaire it was decided to administer the survey entirely online. Initial contact with each force was made directly through the researcher's contacts or the Staff Officer to the Association of Chief Police Officers Alcohol Licensing and Harm Reduction Working Group. Each police force was provided with details as to the purpose and contents of the questionnaire via email and then asked to distribute the survey link to uniformed response officers. As the questionnaire link was circulated by third parties it is not possible to ascertain the exact number of participants to whom the link was distributed, but only police forces in England chose to participate. All participants completed the questionnaire between March and December 2014.

A total of 199 individuals (65% male) completed the questionnaire and responded to a substantive number of questions. Participants had a mean age of 34.69 years (*SD* = 8.41) (range 20 – 55 years) with an average 11.66 years (*SD* = 6.56) experience working for the police (range: 6 months - 29 years). Respondents predominately held the rank of police constable (67.84%) with detective constables (17.58%), sergeants (8.54%), inspectors (3.02%) and Police Community Support Officers (3.02%) also completing the questionnaire. Officers from seven constabularies within England participated in this research; Hampshire (30.2%), Northamptonshire (19.6%), West Mercia (11.1%), West Midlands (10.6%), Cambridgeshire (10.1%); Durham (9.5%) and West Yorkshire (9.0%). There were no significant differences in age ($F(6, 185) = 1.57$, $p > .05$, $\eta p^2 = .05$) or years of experience ($F(6, 191) = 1.85$, $p > .05$, $\eta p^2 = .06$) between the participants from these seven constabularies.

2.2.2. Materials.

Based closely on the work of Evans et al. (2009) a questionnaire was constructed to investigate how frequently police officers deal with intoxicated witness and the practices they employ. The questionnaire (see appendix A) was split into seven sections where in section one, participants were given information about the questionnaire, asked to read a consent form and create a Unique Reference Number (URN). Through this URN number a participant's data could be identified and deleted should they wish to withdraw. Section two contained the demographic information from participants including age, gender, police rank and the number of years in the force. Section three asked officers' questions about the prevalence of intoxicated witnesses and the types of crime they may witness. Section four addressed questions regarding police procedures and their effectiveness in relation to intoxicated witnesses, such as methods for interviewing and identifying these individuals. The fifth section asked officers for their beliefs about intoxicated witnesses, for example if interviewed repeatedly when does an intoxicated witness provide the largest amount of information?, and how accurate is the information witnesses recall. In the final section officers were asked about the demographic groups that most represented intoxicated witnesses and whether there were any issues relating to intoxicated witnesses that the questionnaire had not addressed. The questionnaire used a mixture of multiple-choice, scaled and open-ended questions with an 'I don't know' or a 'not applicable' response available for most questions.

2.2.3. Procedure.

Potential participants were directed to a web page on the Unipark academic survey software website where they were first provided with an information sheet and then a consent form. After consenting to continue participants were asked to create a URN. Participants were then asked to give details of their age, gender, police rank and the numbers of years that they had worked for the police. These demographic questions were followed by the survey itself. Following completion of the questionnaire participants viewed a debrief sheet.

2.3. Results

The initial information sheet of the questionnaire was viewed 682 times, with 544 individuals seeing the consent page and 326 then creating a URN. A total of 324 participants provided their demographic information with 199 participants completing the questionnaire and responding to a substantive number of questions. It is from this sample of 199 participants that the analyses are reported.

2.3.1. Prevalence of intoxicated eyewitnesses.

To ascertain base line measurements, with which to compare respondent interactions with intoxicated witnesses, police officers were asked how many witnesses they interviewed in a typical month. Officers reported interviewing an average of 12.74 witnesses (*SD* = 11.04) a month (range: 0 – 40) with 43.96% of those interviewed being intoxicated at the time of the crime (*M* = 5.60, *SD* = 6.03). Of these intoxicated witnesses, officers took an initial account of the event whilst they were still intoxicated in 46.07% of cases. Based upon their own experience police officers were asked if it was very common, common, unusual, or very unusual for a witness to be intoxicated. The majority of respondents (57.3%) indicated that such an occurrence was common, with a further 24.6% stating that it was very common for a witness to be intoxicated. Only 12.6% of officers considered witness intoxication to be unusual and no respondent claimed witness intoxication to be very unusual (5.5% Don't Know/Not Applicable (DK/NA)). Officers were also asked in relation to what types of crimes they typically encountered intoxicated witnesses. As respondents could select more than one crime the percentages do not add up to 100%. Of the 199 respondents, as seen in Figure 2.1, 93.5% indicated that assaults were commonly associated with witnesses who had consumed alcohol. Other crimes typically associated with intoxicated witnesses were rape (38.7%), volume crimes (20.1%), robbery (19.6%), public order offences (11.6%), motor vehicle crimes (7.5%), domestic crimes (6%), murder (3.5%), criminal damage (0.5%) and other violent crimes (0.5%).

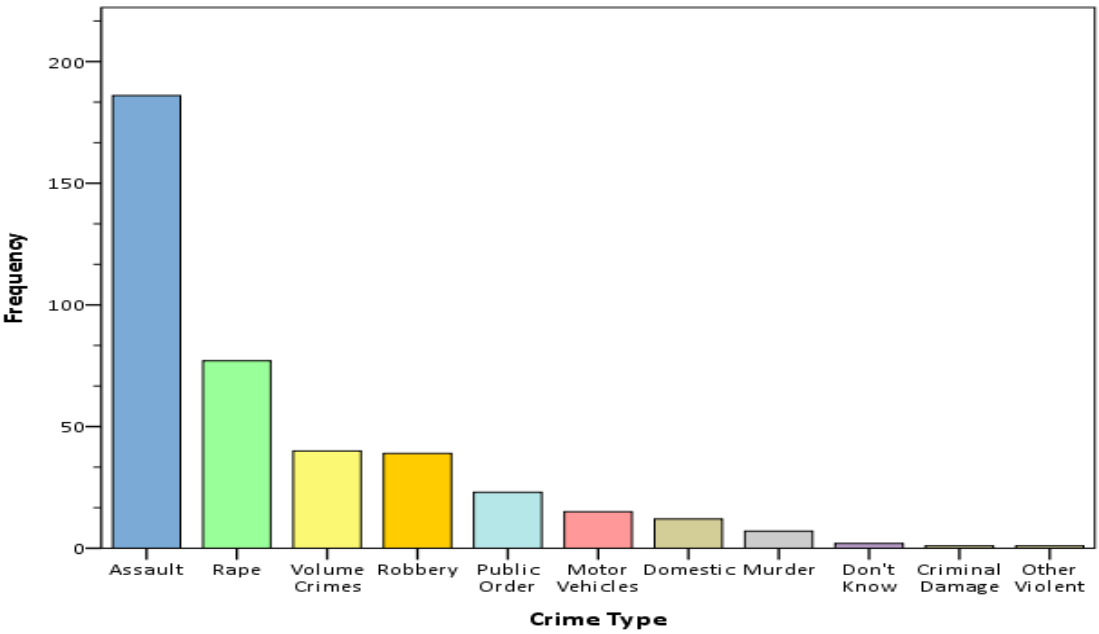

Figure 2.1: Frequency of Officer Responses to the Question "In your Experience, in which Types of Crimes do you Typically Encounter Intoxicated Witnesses?"

2.3.2. Identification of intoxication.

In response to the question "how do you determine if a witness is intoxicated?", as seen in Figure 2.2, 92% of the 192 officers who answered the question indicated that they looked for the physical symptoms of alcohol consumption (e.g., blood shot eyes, slurred speech or loss of balance). For 88 of these respondents this was the only assessment method employed, however, the remaining 104 police officers used multiple means. The witness admitting intoxication (51.8%) and the officer observing the consumption of alcohol (20.1%) were the two primary ways of determining intoxication. Further to this 9.5% of officers indicated that they used other methods to determine intoxication including, general witness behaviour, the officer's years of experience, the smell of alcohol on the witness' breath, information received from others, or an argumentative witness with an inability to communicate.

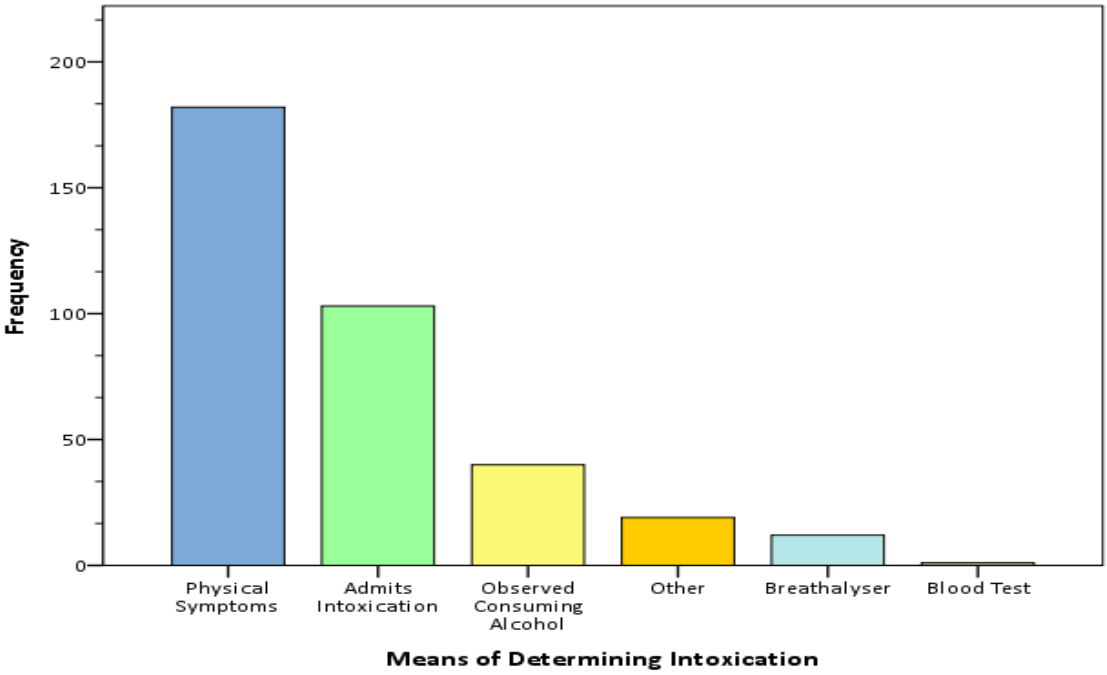

Figure 2.2: Frequency of Officer Responses to the Question "How do you Determine if a Witness is Intoxicated?"

Only twelve officers (6.25%) indicated that they had used objective measures to determine witness intoxication such as a breathalyser or blood test, as they have no power in law to breathalyse or take blood from witnesses. This is supported by the officer responses to the explicit question of "do you ever use a breathalyser on a witness who you believe is intoxicated?" where 91.2% of 192 officers indicated that they had not (2.6% DK/NA). However, ten respondents (5.21%) indicated that they had breathalysed witnesses although only with their consent and even then the reading was merely for internal paperwork and not

included in the official statement. Average readings were considered by these ten officers to be between 0.50 and 0.80mg/L or around one and a half to two times the drink drive limit in England, Wales and Northern Ireland (0.35mg/L). Having established that a witness is intoxicated, officers were asked "how do you decide if they are competent enough to be interviewed?" As respondents could select more than one method the percentages do not add up to 100%. Of the 193 police officers who completed this question only 36.27% used a single means of determining competence, 19.69% used two methods, 32.64% used three and 11.40% used four means. Amongst those who only used one method, common sense was most frequently reported (47.14%).

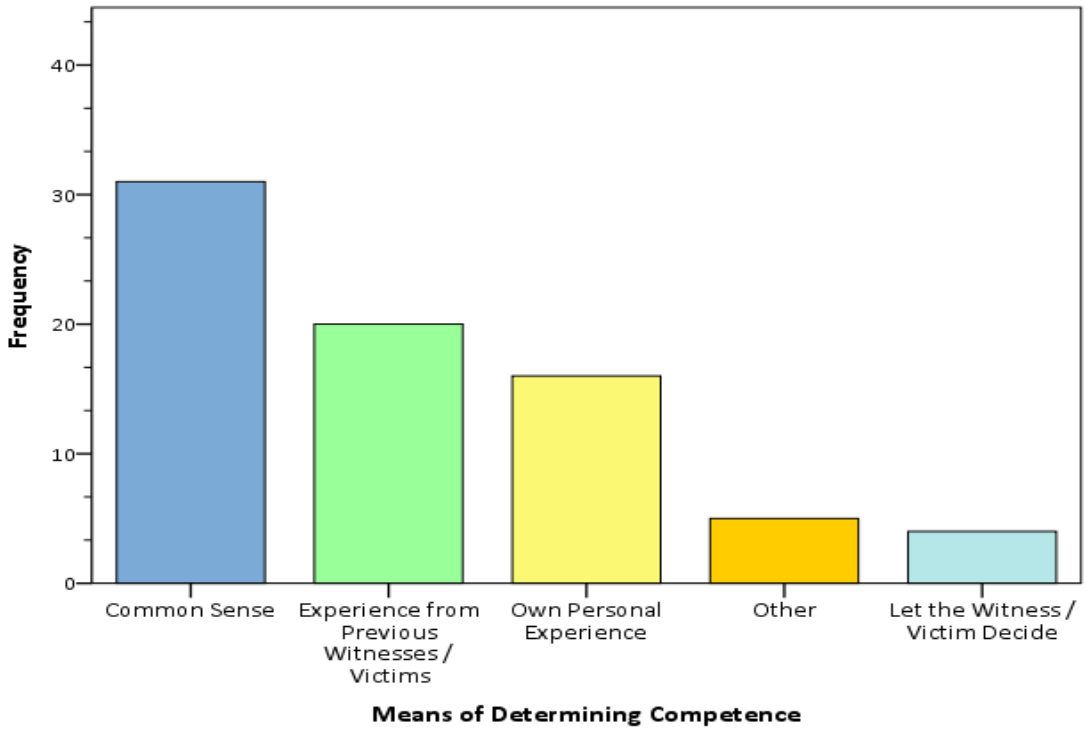

Figure 2.3: Frequency of Officer Responses to the Question "If a Witness has Drunk Alcohol, How do you Decide if they are Competent Enough to be Interviewed?"

In fact, as seen in Figure 2.3, common sense was the most typical way of establishing an intoxicated individual's competence (73.9%) across all 199 officers. Experience from previous witnesses (56.3%) and the officers own personal experience (52.3%) were also dominant factors. Letting the witness decide if they were sober enough to give a statement was selected by 16.6% of respondents whilst 12.1% claimed they use other means such as, the mental capacity test, the national decision model, questioning the witness to assess how capable they are of understanding, the witness' manner/behaviour, ability to engage with officers, physical symptoms, how they hold up to their account being challenged and the time

since their last drink or the amount of alcohol consumed. For those employing two methods, common sense and experience from previous witnesses/victims were the most typical combination employed (34.21%) this was closely followed by common sense and own personal experience (31.58%). A similar pattern was apparent with those using three methods where a combination of experience from previous witnesses/victims, own personal experience and common sense was most typically cited. Of all 199 respondents, only 5% indicated that they used an objective measure such as a blood or breath test to determine competency.

2.3.3. Police procedures with intoxicated eyewitnesses.

Police officers were asked whether their departments' standard procedures for interviewing intoxicated witnesses were the same as, or different from, those employed with sober individuals. Of the 191 respondents to this question, 24.6% indicated their departments' procedures were the same irrespective of whether or not the witness had consumed alcohol (5.8% DK/NA). The majority of police officers (69.6%), however, stressed that their departments' standard procedures for interviewing witnesses were different if they were intoxicated than if they were sober. Of these 133 officers, 48.87% indicated that when dealing with an intoxicated witness they initially assessed the intoxication level of the individual. If they considered the witness to be 'moderately intoxicated' then an initial, less formal, non-evidential account would be taken from the witness through the use of body worn cameras (where available) or in the officer's personal notebook. This account, which some officers referred to as a 'holding statement', incorporates basic event details such as when, where, who and what happened, in order to determine if there was a strong enough case to support the allegation. This also provided a record of the amount of alcohol that was consumed. The initial account would then be followed up by a full formal statement when the witness was sober.

With witnesses who are only 'slightly intoxicated', however, 61.54% of these officers highlighted their discretion as the key determinant of whether a formal statement was taken immediately. In terms of witnesses who were 'heavily intoxicated' 13.30% of the 133 officers indicated that they would never take a statement from such an individual as it would not be achieving best evidence and may even be unlawful. A further 4.5% of officers also indicated that they would only interview an intoxicated witness if it was absolutely necessary, i.e., if it was an emergency and the individual was a key witness and there was no other evidence. These responses suggest that the witness' degree of intoxication is the primary factor that determines the procedures that police officers follow.

2.3.4. Interviewing intoxicated witnesses.

Officers were also asked when they usually interview intoxicated witnesses. In line with the officers' free recall responses with regards to their standard procedures for interviewing intoxicated witnesses, 42.7% of the 193 respondents claimed that they took initial details whilst the witness was intoxicated and then completed a full interview when the individual was sober. A further 13.1% of officers stressed that they waited until the witness was sober before conducting any form of interview and 11.1% revealed they interview individuals whilst they are still intoxicated. From the total of 193 officers, 27.1% indicated that in fact 'it depends' when they interview a witness who has consumed alcohol and most considered multiple factors. As seen in Figure 2.4, amongst these 54 officers the most common factors that determined when an intoxicated witness was interviewed was the seriousness of the offence (40.74%) and the degree of intoxication of the witness (35.19%). This was followed closely by officers indicating that they would take some information whilst intoxicated and the full details when sober (31.48%). The urgency with which the evidence was needed from the witness (16.67%) and whether there was already a suspect in custody (12.96%) were also mentioned. Other factors that the police officers took into account when deciding when to interview an intoxicated witness included, whether the witness was an alcoholic (5.56%), how likely they were to have access to the witness again when sober (3.72%), the role of the witness within the crime (i.e., key witness or victim) (1.86%), whether there was any other evidence (1.86%) and the level of detail that was needed from the witness (1.86%).

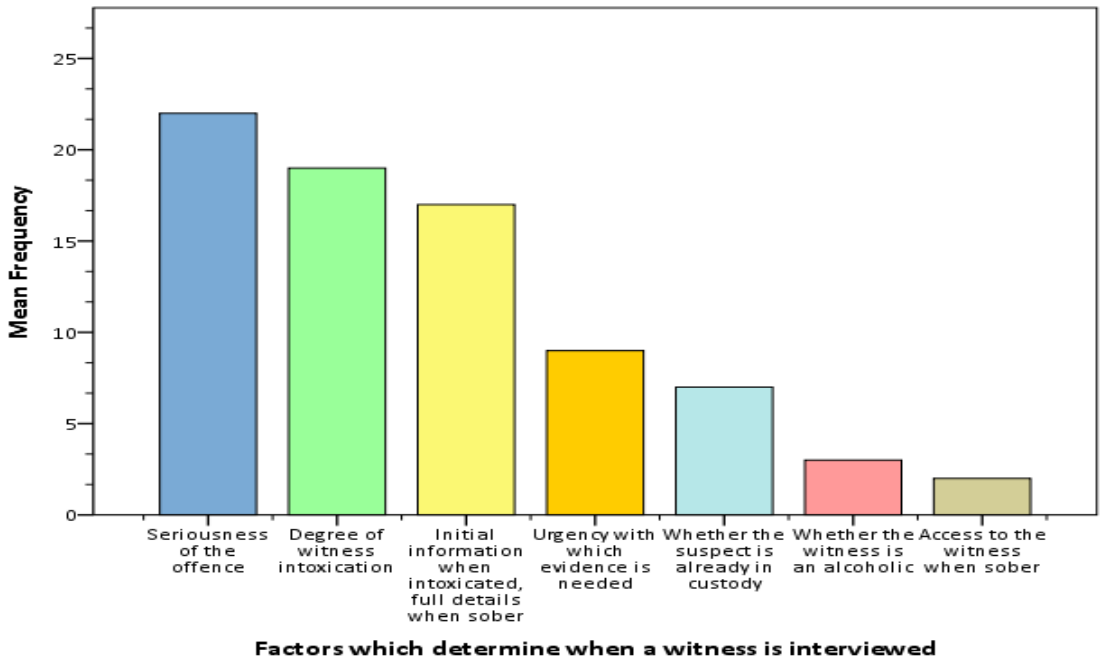

Figure 2.4: Frequency of Officer Responses to the Question "When do you Usually Interview Intoxicated Witnesses?"

2.3.5. Procedures and their effectiveness.

Taking into account the procedures employed within their departments, officers were asked "how effective do you think these procedures are at obtaining useful information from the intoxicated witness?" Responses were given on a scale ranging from 1 (*not at all effective*) to 10 (*extremely effective*). A mean rating of 5.27 (*SD* = 2.08; *Mdn* = 5.00; 6.5% missing) was shown with 20.6% of respondents selecting a rating of 5, namely that they were unsure of the effectiveness of the current procedures. Whilst only 2.5% of officers considered the procedures to be extremely effective (rating of 10), 13.5% of officers did not feel the current procedures were at all effective (rating of 1). When asked "are there any changes you would make to the current procedures for interviewing intoxicated witnesses?" a majority of the 193 officers (55.4%) responded 'no' (16.1% DK/NA), but the remaining 28.5% of respondents thought changes could be made to improve procedures.

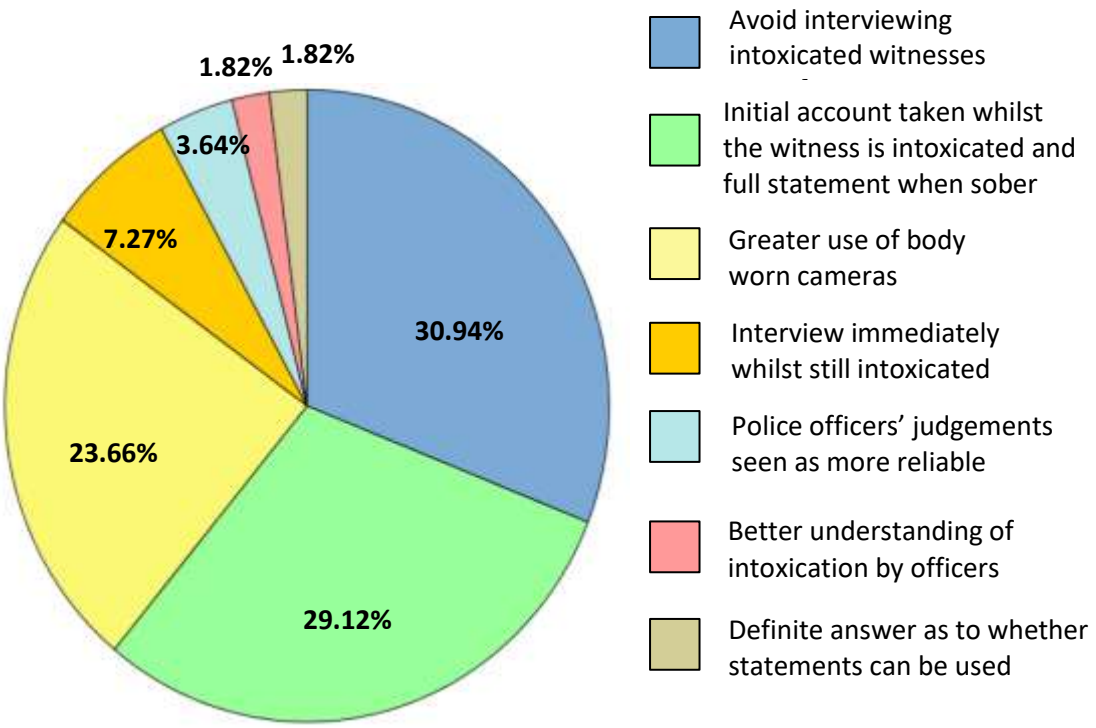

Figure 2.5: Percentage of Responses to the Question "Are there any Changes you would Make to the Current Procedures for Interviewing Intoxicated Witnesses?" (Excluding 'Don't Knows')

As seen in Figure 2.5, of these 55 individuals, 30.94% believed interviewing intoxicated witnesses immediately should be avoided entirely. A further 29.12% suggested

amendments to procedures so that an initial account is taken whilst the witness is intoxicated and the full statement once sober; at least 12 hours after the last alcoholic beverage but within 48 hours. Other suggestions included greater use of body worn cameras to video the intoxicated witness and thereby provide a clearer indication of witness competence (23.66%). Interviewing the witness as soon as possible after the crime (whilst still intoxicated) was also proposed by 7.27% of officers who also indicated that a note of the witnesses' intoxication level should be made in the statement, and a second full interview done when the witness was again sober. Officers felt their own judgement as to the intoxication level of the witness should be considered more reliable and this opinion supported more by Crown Prosecution Service (3.64%). It was also thought that there should be a better understanding of intoxication by officers (1.82%) and some officers wanted a definitive answer as to whether they could use statements from intoxicated witnesses (1.82%).

2.3.6. Police beliefs about intoxicated eyewitnesses.

Within this section of the questionnaire officers were asked about their beliefs regarding intoxicated witnesses, based upon their own experience. As a baseline, respondents were asked on a scale of 1 (*not at all accurate*) to 10 (*extremely accurate*) "how accurate are statements provided by witnesses if they are sober at the time of the crime?" From 190 officers a mean rating of 7.47 (SD = 1.45; Mdn = 8.00) was obtained with zero respondents believing that a sober witness' account was not at all accurate (a rating of 1 or 2). In contrast when asked, on the same scale of 1 to 10, "how accurate are statements provided by witnesses if they are intoxicated at the time of the crime?" there was a significantly lower mean rating of 4.63 (SD = 1.67; Mdn = 5.00) ($t(189) = 23.68$, $p < .001$). Only 1.6% of respondents indicated that an intoxicated witness's statement was extremely accurate (a rating of 9 or 10).

Based upon their own experience officers were asked about the likelihood of a case getting to court. To establish a baseline, officers were asked on a scale of 1 (*not at all likely*) to 10 (*very likely*) "if the witness is sober at the time of the crime, how likely is it that the case will make it to court (if there is no other evidence)?" From 187 respondents, there was a mean rating of 5.84 (SD = 2.45; Mdn = 6). When asked "if the witness is intoxicated at the time of the crime, how likely is it that the case will make it to court (if there is no other evidence)?" the mean rating (on the same 1 to 10 scale) fell significantly to 3.88 (SD = 1.86; Mdn = 4.00) ($t(186) = 12.68$, $p < .001$). No respondent indicated that it was very likely for a case to make it to court if the witness was intoxicated (a rating of 9 or 10). Officers were also asked "if interviewed repeatedly, when do intoxicated witnesses provide the largest amount

of information (irrespective of accuracy)?" From the 192 officers who responded to this question 52.6% believed that intoxicated witnesses provided the most amount of information soon after the crime (whilst they are still intoxicated). An additional 29.2%, however, believed that the largest amount of information is recalled later on when the individual is sober (18.3% DK/NA).

2.3.7. Characteristics of intoxicated eyewitnesses.

In the final section of the questionnaire officers were asked "in your experience what demographic groups most represent intoxicated witnesses?" Regarding gender, of the 187 officers who completed this section of the questionnaire 42.2% indicated an intoxicated witness was just as likely to be male as female. Of the remaining 108 respondents, 38.5% felt that intoxicated witnesses tended to be male and only 19.3% believed most intoxicated witnesses were female. In terms of age, 23.1% of 193 officers indicated that intoxicated witnesses were typically between 20 to 24 years old. A further 17.4% indicated that in their experience witnesses under the influence of alcohol tended to be slightly older at between 25 and 29 years of age. An additional 12.2% of officers felt that intoxicated witnesses were typically between the age of 30 and 34. A total of 9.9% of officers believed witnesses were typically aged between 35 and 39, and a further 9.6% considered witnesses to be under the age of 19. Regarding the ethnicity of intoxicated witnesses, a majority of the 178 officers who responded (75.8%) indicated that such individuals were typically Caucasian, but an extra 21.9% felt that intoxicated witnesses were from no one particular ethnic group. Police officers were also asked if there were any other factors that in their experience were characteristic of an intoxicated witness. Only 58 officers responded to this question and 79.31% of these individuals highlighted additional characteristics. The characteristic most frequently mentioned by officers was socio-economic group (36.12%) with intoxicated witnesses being seen to have low incomes or being unemployed. Officers also indicated that intoxicated witnesses were typically associated with the night-time economy (15.48%) and were either alcohol or drug dependent (13.76%). The witness being known to the police (8.6%) and also withdrawing their testimony once sober were also mentioned by officers (5.16%).

2.3.8. Other issues.

Officers were finally asked "are there any issues or experiences with intoxicated witnesses that have not been addressed in this survey which you think are important?" Whilst 54.4% of the 195 respondents to this question indicated that there were no other issues (14.8% DK/NA), 30.8% of officers did suggest additional issues. Amongst these 60 officers the most

frequently mentioned factor was the influence of individual differences and tolerance to alcohol (20%). For example, respondents stressed that alcoholics or an 'experienced drinker' may have a high BAC and still be lucid whilst a non-alcoholic may be barely able to function. A breathalyser reading in such situations officers indicated would not be useful. Of the 60 officers that suggested further issues, 18.33% emphasized that intoxicated witnesses were more likely to change their mind about testifying. They tended to be very talkative at the time of the crime, want to make a complaint, provide a testimony and were willing to go to court. However, once sober the individual was more reluctant to talk, and often changed their mind and withdrew their testimony. The emotional state of intoxicated witnesses was also mentioned by 11.67% of respondents. If a witness had consumed alcohol they tended to be more emotional, more agitated, less rational and even violent towards police. The final factor mentioned by 10% of respondents was the reliability of the witness and how this translates to their credibility in court. Officers indicated that many intoxicated witnesses themselves felt their evidence would not be believed in court because they had consumed alcohol. Officers also mentioned that they themselves are made to look reckless or incompetent in court if the presented evidence was obtained from an intoxicated person, irrespective of the evidential value.

2.4. Discussion

This is the first study to examine how frequently police officers in England interact with intoxicated witnesses. The research also investigated the extent to which intoxicated witnesses are involved in criminal cases and the procedures officers follow when interviewing such individuals. Within this study, rather than analysing a sample of witness statements from a police force, a questionnaire was used. This decision was made based upon the availability of witness statements and Yuille and Tollestrup's (1990) assertion that not all the required information is consistently reported by officers. According to 81.9% of the officers from the seven police forces who completed the current questionnaire, intoxicated witnesses are a common or very common occurrence. In addition, officers believed that approximately 44% of the interviews they conducted each month were with a witness who was intoxicated at the time of the crime. These findings are in line with the conclusions of Evans et al. (2009) where 73.1% of 119 North American officers stated that interacting with intoxicated witnesses was a common occurrence. The present study also indicated that assault, rape, volume crimes and robbery were the crimes most typically associated with intoxicated witnesses. This is consistent with the evidence of Palmer et al. (2013) where 20.34% of the 639 felony cases (i.e., rape, robbery and assault) studied involved at least one intoxicated witness. These findings suggest that in England, as in North America, intoxicated witnesses

are a widespread issue across a range of serious offences, at least in the seven forces that participated. According to the respondents in this study intoxicated witnesses are typically, Caucasian, aged 20 to 25 and are just as likely to be male as female.

Regarding the procedures typically employed by officers, the majority (69.6%) of respondents in the current research indicated that their departments' standard procedures differed if the witness was intoxicated, and varied further depending on the amount of alcohol that had been consumed. This is in partial accordance with the conclusions of Evans et al. (2009) where 45.5% of officers indicated that they altered their interview procedure if the witness was intoxicated. However, nearly half (44.2%) of the North American officers in Evans et al.'s (2009) research also indicated that they followed the same procedures irrespective of whether the witness had consumed alcohol. This is far higher than the 24.6% who gave the same response in the present research, and suggests that the interview practices within England are more accommodating and adaptable for intoxicated witnesses than the methodologies employed in North America.

Within England, when faced with a potentially intoxicated witness, officers indicated that they typically first determine the individuals' degree of intoxication. If 'heavily intoxicated' most officers stressed that they would not formally interview such an individual. However, if a witness was deemed 'moderately intoxicated' then a non-evidential 'holding statement' would be taken whilst the person was still intoxicated. This allows the investigator to ascertain the bare details of the event before a formal interview is conducted later when the witness is sober. This is not dissimilar to the approach of North American officers where if the witness is interviewed immediately despite being intoxicated and then a follow-up interview is conducted when the individual is sober (Evans et al., 2009). Unlike in North America, however, it is typically only the sober account that is formally recorded and presented in court. If the witness is only 'slightly intoxicated' then the officers' discretion is the primary determinant of whether the witness provides their formal statement immediately or at a later date. Although the interview procedures within England are altered to accommodate the individual circumstances of each witness, this questionnaire highlights potential issues with this approach. Namely officers have no objective means to establish the witness's degree of intoxication and impairment.

In the current research the primary means of determining witness intoxication was the observation of the physical symptoms of alcohol consumption such as slurred speech and loss of balance. This was often coupled with the officer's observation of alcohol consumption and the witness's own admission of intoxication. These findings are in line with the evidence of Evans et al. (2009) where officer experience and the witness' self-confessed consumption

of alcohol were the primary means of assessing intoxication. Whilst Palmer et al.'s (2013) archival analysis also suggested that only 3% of officers determined intoxication through the observation of alcohol consumption, the present research found around 20% of English police officers draw on this means of assessment. Although this method provides a clear indication that a witness has consumed alcohol it does not inform officers of the degree of intoxication or impairment. As in Evans et al.'s (2009) research, however, it appears very few officers use an objective means such as a breathalyser to establish the degree of intoxication. The 6.25% of officers who used a breathalyser in the present study is considerably lower than the 22.1% of North American officers who claimed to breathalyse witnesses (Evans et al., 2009) or the 9% of cases from Palmer et al.'s (2013) archive analysis.

The primary reason for not breathalysing witnesses was that officers in England considered themselves to have no power in law to breathalyse a witness. Unfortunately, this also means that there is very little information as to the typical BAC or BrAC readings of intoxicated witnesses. In North America officers estimated the BACs of intoxicated witnesses to be around .11%. Within the present research, officers considered average intoxicated witness BrACs to be between 0.50 and 0.80mg/L (.11 – .18% BAC). In both cases the readings are rather high at around one and a half times the drink drive limit for England, Wales and Northern Ireland (0.35mg/L or .08%) but these figures are based on the recall and estimates of officers. Future research should therefore seek to assess the effects of alcohol on eyewitness memory with mean BrACs of at least 0.35mg/L. In light of this, this thesis will aim to achieve similar BrAC's when studying the effects of alcohol on witness recall.

Whilst officers in England considered their departments' current procedures to be only reasonably effective at obtaining useful information from intoxicated witnesses, the majority of respondents indicated that there were no changes they would make to the present procedures. Of the amendments that were mentioned though the most frequently suggested were to entirely avoid interviewing witnesses whilst intoxicated or to take an initial statement whilst intoxicated and follow this up with a full interview later when sober. These suggestions highlight a worrying fact, namely that not all officers treat an intoxicated witness in the same manner. For some officers the standard procedure is to take an initial account whilst intoxicated and follow this up later with a full interview, for others they would change their current procedures to this two-stage interview process.

Irrespective of the interview method that the officers followed, the majority of respondents considered intoxicated witnesses to provide the largest amount of information soon after the crime (whilst still intoxicated). The testimony heard in court, however, is the full interview that is completed once the witness is sober. It is the reliability, accuracy and

completeness of this latter testimony therefore that needs to be assessed, as this is the information that jurors make their judgements upon. In terms of the accuracy of a witness' statement police officers believed that intoxicated witnesses were significantly less accurate in their recall than sober witnesses. Officers also believed the testimony of an intoxicated witness was less likely to be heard in court than that of a sober witness. Ultimately this suggests that the recall of an intoxicated witness is seen as less reliable despite very little research having been conducted to support this idea. It is therefore essential that the actual effects of alcohol on eyewitness recall are explored in order to provide a greater understanding of the true influence of intoxication and the reliability of a witness that has consumed alcohol. Further, it is important to examine juror perceptions of intoxicated witnesses.

From a criminal justice perspective, this study suggests that intoxicated witnesses are a common occurrence with such individuals having an average BrAC of around one and a half times the drink drive limit for England, Wales and Northern Ireland. These individuals are considered by officers to provide the most information soon after the crime (whilst still intoxicated), although it is their full statement which they provide later on, when sober, that is presented in court. Officers indicated that they believe this latter testimony to be less accurate than that of a sober person, leading to the testimony being significantly less likely to be presented in court. However, there is very little research that has actually examined the accuracy, reliability and completeness of such a testimony. So, at present it is unclear whether alcohol truly has a negative effect on eyewitness recall. This lack of research needs to be addressed in order for there to be a clearer understanding of the effects of alcohol on eyewitness memory and to ensure that the testimony of such individuals is not unjustly withheld from the court and subsequently not heard by jurors. In order to enhance forensic relevancy, research should therefore seek to replicate these details as close as possible within the confines of health and safety restrictions. As such the studies presented in this thesis investigate how alcohol affects the recall of intoxicated witnesses whose demographics are similar to those indicated by officers. In addition, studies 2a, 2b, 3 and 4 employ a complex and forensically relevant stimuli event to further improve forensic relevancy.

Chapter 3: Study 2a: Testing the Validity of Alcohol Myopia Theory with Intoxicated Eyewitnesses [1]

Abstract

In an assessment of Alcohol Myopia Theory (AMT), this study investigated the effects of alcohol on eyewitness recall of high and low salience details. In light of the propositions of AMT, salience was determined by semantic meaning and spatial location within a complex forensically relevant stimuli event. To this end, in the laboratory, participants watched a staged videoed theft whilst either sober (control or placebo) or intoxicated (ethanol dose = 0.6ml/kg; M_{BAC} = .06%), and a week later returned to the same location to complete a free recall task and true/false recognition test. In both recall tasks participants had a better recall of high salience compared with low salience details. In contrast to the predictions of AMT, however, alcohol was not seen to particularly impair recall for low salience details. Further to this, intoxication was not seen to significantly impair either free recall accuracy or completeness. The relatively moderate levels of intoxication attained within this study are suggested as a possible reason for the lack of effect of intoxication or support for AMT.

[1] Parts of this chapter are published as Crossland, D., Kneller, W., & Wilcock, R. (2016b). Intoxicated Witnesses: Testing the Validity of the Alcohol Myopia Theory. *Applied Cognitive Psychology, 30*(2), 270-281. doi: 10.1002/acp.3209.

3.1. Introduction

Alcohol Myopia Theory (AMT) proposes that alcohol's impairment to perception and thought arises from a disproportionate amount of attention given to the immediate salient cues (both internal and external). Weaker, less salient cues in turn receive less attention (Steele & Josephs, 1990). Salience, the theory stresses, relates to the immediate superficially understood aspects of an event which have an undue influence over an individual's behaviour. Although initially developed as a social psychological theory to account for the risk-taking behaviour of intoxicated individuals, research does indicate that the concept of alcohol myopia has the potential to explain an individual's processing of visual stimuli after consuming alcohol (Clifasefi et al., 2006; Harvey et al., 2013a).

Across different environments, AMT stresses that salient cues in a setting need not be consistent: an item in one event may be a prominent detail whilst in another it is of little influence. It is ultimately the event or situation itself that determines the salience of the elements, not the nature of that detail or cue (i.e., spatial location or information type). To date, however, alcohol and forensic recall studies have mainly focused on a thematic definition where an item is classified according to its 'type'. For example, the perpetrator's face is one such 'type' that is considered highly salient information. In support of AMT research indicates intoxicated individuals are just as accurate as sober witnesses in their identification decisions (Dysart et al., 2002; Hagsand et al., 2013b; Kneller & Harvey, 2016; Read et al., 1992; Yuille & Tollestrup, 1990). Other item 'types' include person/action versus description (Flowe et al., 2016; Harvey et al., 2013b; Read et al., 1992; Schreiber Compo et al., 2011; Van Oorsouw & Merckelbach, 2012; Yuille & Tollestrup, 1990) where researchers who interpret their findings in terms of AMT deem person information and actions to be central (high salience) and surrounding descriptors to be peripheral (low salience).

Classifying information by item 'type', Yuille and Tollestrup (1990) found a significant decrease in overall recall accuracy and completeness when alcohol (M_{BAC} = .10%) was consumed. Subsequent analyses, though, were not provided for recall accuracy or completeness by information type, therefore no assessment of AMT's validity could be derived from this research. Read et al. (1992; exp. 1), however, found moderate intoxication (M_{BAC} = .11%) significantly reduced a mock perpetrator's recall accuracy and completeness for their own actions as well as environmental and person information. The greatest decrease in recall completeness, however, was for person details. These effects, though, were no longer apparent when the recall of an intoxicated perpetrator was compared with the memory performance of a placebo, rather than a sober perpetrator (Read et al., 1992; exp. 2).

Flowe et al. (2016) also found a mean BAC of .08% significantly reduced overall recall completeness compared to less intoxicated (M_{BAC} = .05%) individuals. This effect, however, was also apparent with placebo participants. In contrast to the predictions of AMT, whilst both placebo and intoxicated individuals were more complete in their recall of perpetrator details (central) compared to surrounding details (peripheral), there was no interaction between intoxication level and information type. In terms of recall accuracy, alcohol (M_{BAC} = .08%) was seen to negatively affect 'overall' accuracy but not 'report' accuracy. Further to this, no interaction between intoxication level and information type was indicated. Using a recognition test, Harvey et al. (2013b) found that, with a static image, higher degrees of intoxication (M_{BAC} = .12%) did not significantly reduce the overall accuracy of an individual's recall compared to sober participants. Contrary to the predictions of AMT, when the perpetrators actions and possessions were deemed to be central and surrounding details were peripheral, Harvey et al. found no interaction between intoxication level and information type. Schreiber Compo et al. (2011) also adopted a, person/action versus description definition of centrality. The appearance and actions of the bartender were deemed central, whilst descriptions of the environment were classed as peripheral. In line with the expectations of AMT, the peripheral recall of intoxicated individuals (M_{BAC} = .08%) was significantly poorer than both control and placebo (M_{BAC} = .01%) participants. For central information no effect of intoxication was found. However, intoxicated individuals provided their free recall whilst still under the influence of alcohol. So, the conclusions drawn from this research, and the support offered for AMT are potentially confounded by state-dependency recall effects (Parker et al., 1976; Weissenborn & Duka, 2000).

Further to these laboratory studies, initial field study research (Van Oorsouw & Merckelbach, 2012) looking at intoxicated perpetrator recall has also adopted a person/action versus description definition of centrality. Perpetrator actions and possessions were deemed central and surrounding descriptions were peripheral. Intoxication (M_{BAC} = .06% and M_{BAC} = .17%) was seen to significantly decrease recall accuracy on a cued but not free recall task. No interaction between information type and intoxication level was indicated. In terms of recall completeness, for both the free and cued recall task, alcohol reduced the amount of information recalled. Only on the free recall task, however, was an interaction between information type and intoxication level apparent. Contrary to AMT, but consistent with Read et al. (1992) it was the recall completeness of central, rather than peripheral, details that was particularly impaired by intoxication. For central details, 18-33% fewer details were recalled compared with only a 2-8% reduction in peripheral details. However, as already

indicated, Van Oorsouw and Merckelbach (2012) investigated the effects of alcohol intoxication on the recall of a perpetrator rather than a witness.

Within alcohol and forensic memory studies spatial location has also been utilised to group items (Harvey et al., 2013a), where information that is at the physical centre of a person's field of vision is deemed central (high salience) and details surrounding this are peripheral (low salience). In a free recall task completed once sober, Harvey et al. (2013a) deemed details at the spatial centre of a static visual scene to be central. Peripheral items, conversely, were those elements situated spatially around the central item. Eye-tracking technology confirmed that, consistent with AMT, alcohol narrowed the attention of participants to those items classed as central. In terms of recall, intoxicated individuals were less complete in their overall recall than sober participants. Contrary to AMT, however, the recall deficit in relation to peripheral details was not significantly larger for intoxicated individuals than sober participants. The researchers attribute the conflicting findings of Harvey et al. (2013a) and Harvey et al. (2013b) to the different stimuli events and recall methods employed (free recall and recognition test respectively).

Each of the aforementioned studies that have sought to test or discuss their results with respect to AMT have classified the items observed by participants as either of high or low salience based upon the type/nature of the item or its spatial location. However, salience as proposed by Steele and Josephs (1990) does not classify information in these terms. The salience of the item, the theory emphasises, depends on the event or scenario and the importance of the details to the unfolding event. As a result, salience must take into account both spatial location and semantic meaning. A classification of information salience which takes in to account not one but both of these factors, and also involves a complex and forensically-relevant event is therefore needed to fully assess the applicability of AMT to explain the recall pattern of an intoxicated witness.

The aim of the present research was therefore to examine the effects of intoxication on the recall of high and low salience information, where detail salience was determined by both its spatial location and semantic meaning within a complex event. Due to the conflicting conclusions of Harvey et al. (2013a, 2013b), where different recall methods were employed, both a free recall task and a recognition test were used in the current study. Considering the propositions of AMT (Steele & Josephs, 1990) it was initially hypothesised that participants would have better recall of high rather than low salience information, irrespective of their intoxication level. Further to this it was also hypothesised that alcohol would impair the recall of intoxicated participants, with details of both low spatial and semantic salience suffering the greatest impairment.

3.2. Method

3.2.1. Participants.

Based on a priori power analysis to obtain statistical power at the recommended .80 level (f = .25, α = .05; Cohen, 1988), as was discussed previously in section 1.4.4. Experimental Power; a total of 66 undergraduates (85% female) participated with ages ranging from 18-56 years (M = 21.2 years, SD = 6.87). Age restrictions were introduced to ensure that participants were not deemed older witnesses, as these individuals generally have poorer recall than younger adults (Bornstein, Witt, Cherry, & Greene, 2000; Rose, Bull, & Vrij, 2003; Wilcock, 2010). All student volunteers were recruited through the University's SONA participant pool management software and received £5 and course credit for their participation. As per Yuille and Tollestrup's (1990) research, the study was advertised to participants as studying the effects of alcohol on memory. Prior to taking part each student completed a comprehensive screening process to establish their eligibility to participate (see appendix B). Age, weight, drinking history and medical conditions were established to ensure it was safe for each individual to consume alcohol.

Potential participants were asked to declare whether they had consumed at least 6-9 units of alcohol in a single sitting within the past 3 months. This ensured that they had recently consumed at least the same amount of alcohol that would be administered in the study. To assist potential participants to accurately report the alcohol units they consumed, each individual was provided with the World Health Organisation Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001); to convert a variety of drinks to alcohol units. If participants also indicated that they had no medical reason to abstain from consuming alcohol, were not on medication and had no other reason not to drink then they were allowed to participate. To protect participants and to help ensure suitable BrAC levels were attained, all participants were weighed so that only those between 55 and 95kg took part (see section 1.4.2. Achieving specific blood and breath alcohol concentrations).

3.2.2. Design.

The study utilized a 3 (Drinking condition: alcohol, non-alcohol or placebo) x 2 (Information salience: high or low) mixed design with information salience assessed within participants. The 22 participants in the alcohol condition were given a dose of 0.6ml of 96% ethanol per kg of body weight with lemonade to make up 450ml of fluid. These doses were based upon previous studies (Harvey et al., 2013a, 2013b) and for ethical reasons were employed to ensure that, as with most of the laboratory based alcohol literature, participant BrACs were not significantly higher than 0.35mg/L. As per previous research (Fillmore & Vogel-Sprott,

1995) 22 placebo participants were given an equivalent volume of lemonade with 5ml of ethanol floating on top. In addition, a 50:50 mixture of ethanol and water was spritzed around the glass' rim, to provide the odour of alcohol. The 22 participants in the non-alcohol condition were given a drink of comparable volume, comprising only of lemonade. All drinks were made out of sight of participants. Whilst non-alcohol participants were told that they would not be drinking alcohol, both alcohol and placebo participants were told only that their drink should contain enough alcohol to put them over the drink drive limit. For placebo participants, this information was inaccurate. In order to reduce the chance of participants using deliberate encoding strategies to remember the stimuli event, participants were not specifically told they would be asked to recall the stimuli event in the second session

3.2.3. Materials.

3.2.3.1. Stimuli event.

The three minute stimuli event video was presented to all participants on the same PC monitor and showed a man walking into a building. He initially walked down a corridor where he touched a number of lockers before attempting to break-in to two, but failed. He then entered a classroom which he walked around before stealing a laptop and putting it in his bag. In this room the PowerPoint screen was showing $E = MC^2$ and there were multiple posters on the walls covering a range of different teaching topics. There was also a desktop computer, mugs, chairs and tables as well as large windows through which cars and other buildings could be seen. He left this room and entered a classroom area which contained chairs and a sofa, and where the walls were again covered in teaching posters. He initially attempted to open two doors but failed and then picked up and dropped a large teddy bear, before looking into a bag and stealing money from a purse. He then left the room and the video ended. The man was in view throughout the three-minute event which was produced by the researcher for a previous unpublished study looking at an individual's suggestibility to central and peripheral misinformation.

3.2.3.2. Recognition test.

Using the stimulus event, a 40-item recognition test was developed (see appendix C). Within this test participant memory was assessed in relation to what was seen throughout the video, both in terms of semantic salience and spatial location. Details of what the man was doing, wearing and what was seen in the environment were also included. Classification of statements as either high or low salience was determined in a two-stage process focusing on the semantic *and* spatial nature of the details (Wright & Stroud, 1998).

Firstly, semantic salience was established by a separate sample of 25 participants (*M*

= 29.56 years, *SD* = 9.73) who, whilst watching the video, indicated the salience of each of the 40 statements on a 7-point scale (1 = *high salience* to 7 = *low salience*). Participants could pause the video to code the statements, and were informed that they were to consider statements as more highly salient if they were important in relation to the event they were viewing, or the details could not be changed without affecting the basic story. The details of such statements, however, would not necessarily need to be located at the centre of the screen. Participants were told to consider statements as low salience if they referred to details that were not the focus of attention and would not affect the basic story if they were eliminated or altered. These details, though, need not be on the periphery of the screen (Sutherland & Hayne, 2001). With these distinctions, participants deemed statements such as "the man stole a laptop off a desk" to be of high salience whilst, "an orange and a white mug were shown on the laptop desk" were considered to be of low salience. The mean score for each statement was then used to split the statements into high (*M* = 2.34, *SD* = 0.20; range: 2.04 – 2.92) and low salience (*M* = 6.36, *SD* = 0.47; range: 4.96 – 6.36) with no overlap between the two groupings. A free marginal Kappa of .71 for high salience and .61 for low salience statements (Fleiss, 1971) indicated a substantial and moderate agreement between raters respectively (Landis & Koch, 1977).

Secondly, a spatial classification for each statement was produced by the researcher according to the location of the detail on the screen (or in the participant's visual display) in relation to the perpetrator – the expected focus of the participant's attention. Highly spatially salient details were those that shared screen space with the perpetrator, but were not obscured by his presence, or were the only details on the screen. Details of low salience were those that were partially obscured by the perpetrator or were far from the perpetrator on the screen. Those statements that were classed as of high salience for both semantic and spatial assessments were considered as such within the recognition test and the subsequent analyses. Those statements deemed to be of low salience both semantically and spatially were again considered as such within the recognition test and analyses. This resulted in 20 critical statements (10 of high and 10 of low salience) with 50% being true and 50% false. The remaining 20 statements (those not consistently of high or low salience) were used as fillers. Statements were made false by altering a detail, such as stating that the perpetrators t-shirt was a V-neck when it was actually a round neck. Each recognition test consisted of these 40 statements in a different randomized order with a confidence scale for each. For each statement a true or false response was required along with a rating of confidence on a 5 point Likert scale where 1 = *total lack of confidence* and 5 = *total confidence*. A copy of the recognition test can be seen in appendix C.

3.2.4. Measures.

Dependent measures of recall were: the number of true/false responses to the critical recognition test statements, and the confidence associated with each response (5-point scale: 1= *total lack of confidence*, 5 = *total confidence*). Following the procedure of Yuille and Tollestrup (1990), each detail provided by participants in the written free recall task was given two scores reflecting the amount of correct or incorrect information that was given. For example: 'the thief wore a white t-shirt' scored 2 correct points (1 for the accurate colour and 1 for the style of top), whereas 'the thief wore a white round neck t-shirt' scored 3 correct points (the extra point gained for the collar shape). If the collar had been incorrectly recalled as a V-neck then the statement would have scored 2 correct points and 1 incorrect point. A higher correct or incorrect score therefore indicated more correct or incorrect units of information respectively. With two scorers blind to the participants drinking condition an inter-rater reliability score of .90 was obtained using the Kappa statistic. In terms of free recall, accuracy scores were calculated by dividing the number of correct details reported by the total number of details reported (i.e., correct + incorrect). Measures of memory completeness were obtained by dividing the number of details recalled correctly by the maximum score possible.

3.2.5. Procedure.

Prior to stage one, in line with ethical requirements, all participants completed the screening form (appendix B) to ascertain their eligibility to participate. If their eligibility was confirmed, participants were informed that they may be over the drink drive limit at the end of stage one, and should therefore ensure that they have a safe means of returning home (e.g., not drive) and not engage in anything inappropriate (e.g., attend lectures) or dangerous (e.g., play sport or operate machinery) after the experiment, whilst they are still intoxicated. All participants were also required to eat a light meal 1-2 hours before they arrived at the research laboratory.

Stage 1: On arriving at the laboratory, participants read the study information sheet, (see appendix D), were reminded that they may be over the drink drive limit at the conclusion of the session and signed the attached consent form if they wished to proceed. All participants were then breathalysed using a Lion Alcometer 500 (Lion Laboratories, Barry, UK) to confirm their sobriety. The unit of measurement with this breathalyser was milligrams of alcohol per litre of breath (mg/L). The device has been approved by the UK Home Office since 2004 for use by the UK police for alcohol screening (Home Office, 2004), and was routinely calibrated by the manufacturer once every six months as per the manufacturers' recommendation. Participants were subsequently weighed before being randomly assigned

to a drinking condition, and their drink being produced out of their sight. On being handed their beverage all participants had 15 minutes to consume the drink at a steady pace, and a further 15 minutes to allow their BrAC to rise. As indicated in section 1.2.2. (Biological effects of intoxication), the liver is capable of oxidizing around 10 ml of pure alcohol an hour. Consequently, as with previous research (Kneller & Harvey, 2016), a 15-minute wait ensured that participants were still on the ascending limb of the blood alcohol curve (Jones, 1990). Participants were then breathalysed (but were not advised of the reading) and asked to provide a subjective rating for their perceived level of intoxication on a scale of 0 - 100 (0 = *completely sober* to 100 = *as drunk as you have ever been*). All participants then proceeded to watch the stimulus event. At the end of the video, as per ethical requirements, participants were breathalysed and informed as to their drinking condition and their BrAC. This session lasted on average 50 minutes. Those over the drink drive limit for England, Wales and Northern Ireland were advised to remain in the laboratory until their BrAC lowered to below 0.30mg/L or M_{BAC} = .07% (i.e., under the drink drive limit for England, Wales and Northern Ireland). If a participant refused to remain in the laboratory they were reminded that they were still intoxicated. If they persisted in their request to leave before their BrAC had lowered to 0.30mg/L, then they were asked to sign a disclaimer form (appendix E).

Stage 2: A week later participants returned to the laboratory and were breathalysed to confirm their sober state (BrAC: 0.00mg/L). A written free recall task (appendix F) was then completed with participants being asked to write down 'as much information as you can remember from the video you saw last week, no matter how small or trivial you think those details may be. Additionally, please include any information you can recall in relation to the actions and appearance of the man, and his environment. There is no time limit to this task.' The written free recall task was followed by the self-administered 40-item recognition test (appendix C). If individuals were unsure as to the veracity of a statement they were told to give the response they thought was more accurate (i.e., true or false), and reflect their lack of confidence on the accompanying scale. Once the test was completed participants were given the debrief sheet (appendix G) and any questions and queries were answered.

3.3. Results

3.3.1. Breath alcohol concentration.

Participant intoxication was initially assessed through their breath alcohol concentration (BrAC). However, in order to be in line with previous research all BrACs were converted to blood alcohol concentrations (BAC) with a blood: breath ratio of 2,300: 1. Based upon their weight, participants in the alcohol condition were given between 44 and 68ml of 96% Alcohol

By Volume (ABV) (*M* = 53.86 ml, *SD* = 6.99). Immediately before watching the stimuli event the BAC for those participants in the alcohol condition ranged from .03 - .10%, with a mean of .06% (*SD* = .02). The mean BAC for those in the alcohol condition was therefore just under .08%, the current drink drive limit for England, Wales and Northern Ireland. All placebo participants provided a BAC of .00% to confirm their sober state. A univariate analysis on participant age did not indicate a significant difference between non-alcohol (*M* = 23.64, *SD* = 3.06), alcohol (*M* = 19.23, *SD* = 0.92) and placebo (*M* = 20.73, *SD* = 3.54) participants ($F(2, 63) = 2.45$, $p > .05$, $\eta p^2 = .07$). In terms of participant gender a chi-square analysis did not indicate a significant interaction with drinking condition ($\chi^2(2, N = 66) = 4.48$, $p > .05$). A further t-test indicated that the BAC of male participants was not significantly different from that of female participants ($t(64) = 1.34$, $p > .05$). A t-test also indicated that the BAC of intoxicated participants at the time of encoding the video was not significantly different from their BAC at the end of stage one of the study ($t(21) = 1.30$, $p > .05$).

3.3.2. Perceived intoxication levels.

To confirm the success of the placebo manipulation a rating of perceived intoxication was taken on a scale of 0 - 100 (0 = *completely sober* to 100 = *as drunk as you have ever been*). This method has been successfully adopted in previous research (Kneller & Harvey, 2016). Compared with the placebo (*M* = 14.18, *SD* = 14.10) and sober condition (*M* = 0.00, *SD* = 0.00), alcohol participants (*M* = 39.30, *SD* = 4.37) provided significantly higher subjective ratings of intoxication ($F(2, 63) = 42.17$, $p < .05$; $\eta p^2 = 0.57$). This, however, is typical for post-experimental manipulation checks in relation to placebo conditions (see Testa et al., 2006). Surprisingly though, for those in the alcohol condition there was also no significant correlation between their perceived level of intoxication and their BAC reading ($r_s(22) = .24$, $p > .05$). In addition, of the 22 placebo participants only 4 believed themselves to be entirely sober (score = 0). Thus, it was concluded that the placebo manipulation was moderately successful.

3.3.3. Recognition test.

3.3.3.1. Recognition test responses.

The number of accurate responses given by each participant to the 20 critical statements (10 of high salience and 10 of low salience) was calculated and a 2 x 3 mixed ANOVA was conducted. As seen in Table 3.1, irrespective of drinking condition, participants provided a significantly higher number of accurate responses (out of 10) to highly salient items (*M* = 7.71, *SD* = 1.23) compared to those of low salience (*M* = 5.17, *SD* = 1.37) ($F(1, 63) = 115.81$, *p*

< .001, $\eta\rho^2$ = .65). Differences, however, were fairly minimal by salience across drinking conditions. Whilst the alcohol condition provided more accurate responses than non-alcohol participants in relation to high salience information, this pattern was reversed for low salience details. Placebo participants were the most accurate across drinking conditions and information salience. There was, however, no effect of drinking condition ($F(2, 63) = .39$, $p > .05$, $\eta\rho^2 = .03$) or interaction with information salience ($F(2, 63) = .23$, $p > .05$, $\eta\rho^2 = .01$).

Table 3.1: Means (SDs) of Accurate Recognition Test Responses by Drinking Condition and Information Salience

	Alcohol	Non-Alcohol	Placebo	Total
High Salience	7.77 (1.27)	7.50 (1.34)	7.86 (1.08)	7.71 (1.23)
Low Salience	5.00 (1.07)	5.09 (1.38)	5.41 (1.62)	5.17 (1.37)
Total	6.39 (1.17)	6.30 (1.35)	6.64 (1.35)	

3.3.3.2. Recognition test responses with extreme BACs.

To examine whether this lack of a main and interaction effect, with regards to drinking condition, was the result of the relatively mild levels of intoxication participants experienced (*M* = .06% compared to the .08% drink drive limit for England, Wales and Northern Ireland), a further mixed ANOVA was conducted. The recall of the five participants with the highest BAC readings (*M* = .08%, *SD* = .01) was compared with corresponding participants in the non-alcohol condition matched by weight, gender then age. As seen in Table 3.2, those individuals who consumed alcohol still recalled more details of high salience than those in the non-alcohol condition. With regards to low salience details though there was no difference in the recall accuracy of alcohol and non-alcohol participants.

Table 3.2: Means (SDs) of Accurate Recognition Test Responses by Information Salience for the Five Highest BAC and Matched Non-Alcohol Participants

	Alcohol	Non-Alcohol	Total
High Salience	8.00 (1.58)	7.20 (0.84)	7.60 (1.27)
Low Salience	5.20 (1.30)	5.20 (2.17)	5.20 (1.69)
Total	6.60 (1.44)	6.20 (1.51)	

A 2 x 2 mixed ANOVA indicated that, irrespective of drinking condition, recall was significantly less accurate in relation to low salience details (M = 5.20, SD = 1.69) compared with high salience details (M = 7.60, SD = 1.27) ($F(1, 8) = 11.29$, $p = .01$, $\eta p^2 = .585$). Again, no effect of drinking condition ($F(1, 8) = 0.36$, $p > .05$, $\eta p^2 = .04$) or interaction with information salience was highlighted ($F(1, 8) = 0.31$, $p > .05$, $\eta p^2 = .04$). The sample size in this analysis (N = 10), however, may have simply not been providing the power necessary to fully understand the relationship between these variables. Whilst the effect size increased for both the non-significant effect of drinking condition (ηp^2 from .03 to .04) and the interaction (ηp^2 from .01 to .04), a post-hoc power analysis indicated the associated sample size had only 29% power to detect a medium effect and 60% power to detect a large effect.

3.3.3.3. Recognition test response confidence.

For each statement participants rated their confidence in their response on a 5 point Likert scale where 1 = *total lack of confidence* and 5 = *total confidence*. Participant confidence ratings for each of the 20 critical statements were analysed by a 2 x 3 mixed ANOVA. The analysis indicated a main effect of salience ($F(1, 63) = 465.78$, $p < .001$, $\eta p^2 = 0.88$) and as seen in Table 3.3, high salience details (M = 38.14, SD = 5.56) were recalled with greater confidence than low salience information (M = 23.02, SD = 6.47). No main effect of drinking condition ($F(2, 63) = 2.38$, $p > .05$, $\eta p^2 = 0.07$), or interaction with information salience was indicated ($F(2, 63) = 1.91$, $p > .05$, $\eta p^2 = 0.06$).

Table 3.3: Means (SDs) of Total Confidence Ratings by Drinking Condition and Information Salience (Out of 50)

	Alcohol	Non-Alcohol	Placebo	Total
High Salience	36.64 (5.55)	39.41 (5.80)	38.36 (5.20)	38.14 (5.56)
Low Salience	22.05 (5.67)	25.64 (7.04)	21.36 (6.08)	23.02 (6.47)
Total	29. 35 (5.61)	32.52 (5.52)	29.86 (5.64)	

3.3.4. Free Recall.

3.3.4.1. Completeness for high and low salience details as per the recognition test.

The salience of the free recalled details was determined by whether that detail was deemed to be of high or low salience within the recognition test, thereby taking into account both semantic and spatial definitions of salience. As a result, details that were recalled but were not classed as high or low salience within the recognition test were not coded or analysed. Using the scoring procedure of Yuille and Tollestrup (1990), the higher the free

recall scores produced, the more correct or incorrect units of information the individual had recalled. As more than one point was available for each of the critical statements, a maximum score of 26 was possible for high salience details and a maximum score of 24 for low salience details. Whilst alcohol participants recalled between 3 and 25 correct details *(M* = 13.41, *SD* = 6.21) non-alcohol participants recalled between 1 and 29 details *(M* = 13.09, *SD* = 5.82) and placebo participants recalled between 3 and 20 *(M* = 12.50, *SD* = 5.02). To ascertain the completeness of participant recall, the number of correctly recalled details was divided by the maximum scores possible for each type of information. As seen in Table 3.4, a 2 x 3 mixed ANOVA indicated participants provided a significantly less complete account in relation to low (*M* = .03, *SD* = .04) as opposed to high salience details (*M* = .47, *SD* = .19) ($F(1, 63) = 387.83$, $p < .001$, $\eta\rho^2 = .86$). In terms of the overall recall completeness of each of the three drinking conditions no significant effect was apparent ($F(2, 63) = 0.15$, $p > .05$, $\eta\rho^2 = .01$). In addition, no interaction between drinking condition and salience ($F(2, 63) = 0.28$, $p > .05$, $\eta\rho^2 = .01$) was highlighted.

Table 3.4: Mean (SD) Proportion of Correct Free Recalled Details by Drinking Condition and Information Salience

	Alcohol	Non-Alcohol	Placebo	Total
High salience	.48 (.20)	.48 (.21)	.45 (.18)	.47 (.19)
Low salience	.04 (.06)	.02 (.04)	.03 (.04)	.03 (.04)
	.27 (.12)	.26 (.11)	.25 (.10)	

For incorrect details, as seen in Table 3.5, across drinking condition and information salience participants recalled few incorrect details. A 2 x 3 mixed ANOVA indicated that participants recalled significantly more incorrect details in relation to high (*M* = 0.44, *SD* = 0.83) as opposed to low salience information (*M* = 0.15, *SD* = 0.40) ($F(1, 63) = 7.63$, $p = .01$, $\eta\rho^2 = .12$). No effect of drinking condition ($F(2, 63) = 0.67$, $p > .05$, $\eta\rho^2 = .01$) or interaction between salience and drinking condition was indicated ($F(2, 63) = 0.28$, $p > .05$, $\eta\rho^2 = .01$).

Table 3.5: Mean (SD) of Incorrect Free Recalled Details by Drinking Condition and Information Salience

	Alcohol	Non-Alcohol	Placebo	Total
High salience	0.55 (1.01)	0.32 (0.89)	0.45 (0.51)	0.44 (0.83)
Low salience	0.18 (0.50)	0.14 (0.35)	0.14 (0.35)	0.15 (0.40)
	0.73 (1.16)	0.45 (1.10)	0.59 (0.67)	

3.3.4.2. Accuracy for high and low Salience details as per the recognition test.

Accuracy rate was established by dividing the number of correct units recalled by the total number of correct and incorrect details remembered. As there were participants in each of the drinking conditions who did not recall any low salience details, analyses of accuracy looked only at the effect of drinking condition not salience. There were no confabulations from participants and only eight participants provided subjective details in their written accounts which were ignored in the analyses. A univariate ANOVA on accuracy rate did not indicate a significant difference between alcohol (M = .94, SD = .10), non-alcohol (M = .95, SD = .10), and placebo (M = .96, SD = .05) participants ($F(2, 63) = 0.99$, $p > .05$, $\eta\rho^2 = .03$).

3.3.4.3. Recall accuracy and completeness of female participants.

Within this study a disproportionate number of participants were females (85%). As previous research (Hildebrand Karlén et al., 2015) suggests that the recall completeness of women (but not men) is negatively affected by intoxication, yet gender does not affect recall accuracy, further analyses were conducted. Only 10 male participants took part in this study with an uneven distribution across the three drinking conditions (Non-Alcohol = 1; Alcohol = 6; Placebo = 3). It was therefore not possible to compare male and female recall directly. However, as Hildebrand Karlén et al.'s research indicates that an effect of drinking condition may only be evident with female participants, the free recall completeness and accuracy analyses (section 3.3.4.1. and 3.3.4.2.), were conducted with only the 56 female participants. A 2 x 3 mixed ANOVA (with Bonferroni correction) on recall completeness indicated a main effect of salience ($F(1, 53) = 302.55$, $p < .001$, $\eta\rho^2 = .85$), but as with the full analysis no main effect of drinking condition ($F(2, 53) = 0.56$, $p > .05$, $\eta\rho^2 = .02$) or interaction between the variables ($F(2, 53) = 0.44$, $p > .05$, $\eta\rho^2 = .02$). For recall accuracy, a univariate ANOVA did not indicate a significant difference between alcohol, non-alcohol and placebo participants ($F(2, 53) = 0.72$, $p > .05$, $\eta\rho^2 = .03$). Whilst the lack of effect of drinking condition on the recall accuracy of women is consistent with Hildebrand Karlén et al. this same lack of effect in relation to recall completeness is not consistent. However, as in the present study, Hagsand et al. (2013a) found that when compared to sober individuals; neither the recall accuracy nor completeness of female participants was affected by intoxication.

3.3.5. Results summary.

In summary, on the recognition test, high salience details were recalled more accurately and with greater confidence than low salience details. High salience details were also recalled more completely on the free recall task. In addition, alcohol was not seen to significantly

affect the number of incorrect details, or the accuracy and completeness of an individual's recall when memory was assessed through either the recognition test or free recall. This lack of a significant effect of drinking condition and interaction effect was apparent even when recognition test recall analyses were restricted to those with the highest BACs. An increase in effect size, however, for both drinking condition and interaction effects was apparent. Alcohol was also not seen to significantly affect the memory confidence of participants. In contrast to the findings of Hildebrand Karlén et al. (2015) but consistent with the conclusions of Hagsand et al. (2013a) when free recall completeness analyses were restricted to female participants, no effect of drinking condition was indicated. The lack of effect of drinking condition on the free recall accuracy of female participants, however, was consistent with the findings of both Hagsand et al. and Hildebrand Karlén et al. (2015).

3.4. Discussion

This study sought to assess AMT as a means to explain the recall of an intoxicated individual by examining the effects of alcohol on the recall of high and low salience information, where salience was determined by both a details semantic meaning and its spatial location within a complex event. In line with initial predictions participant recall on the recognition test was more accurate in relation to high salience information irrespective of the individuals' intoxication level. Additionally, participants were also more complete in their free recall of high salience rather than low salience details. Contrary to the propositions of AMT and also the hypotheses of the present study, no effect of intoxication was apparent, in relation to the accuracy or completeness of recall, when memory was assessed through the recognition test and free recall. Neither was alcohol or the belief that alcohol had been consumed found to significantly affect memory confidence. It was also hypothesised that alcohol would particularly impair an individual's recall for details that were of both low spatial and semantic salience. Whilst the low salience recall of intoxicated witnesses was indeed less accurate than that of non-alcohol and placebo participants on the recognition test, this effect was not significant. In contrast, when the recognition test analysis was restricted to those participants with extreme BACs, the low salience recall accuracy of intoxicated participants was seen to be identical to non-alcohol participants. Further to this, when assessing free recall completeness, intoxication was seen to actually increase peripheral recall compared to non-alcohol and placebo participants, although again this effect was not significant.

Consequently, the findings of this study suggest that the recall pattern of intoxicated witnesses does not follow the predictions of AMT. Although information of low salience was recalled with less accuracy and completeness than high salience details, intoxicated

individuals did not have a significantly poorer recall for these low salience details than either the placebo or non-alcohol participants. This finding conflicts with the conclusions of Schreiber Compo et al. (2011) where intoxicated individuals were seen to have significantly poorer correct peripheral recall than both non-alcohol and placebo participants. As previously indicated, research has also suggested that both the accuracy and completeness of central and peripheral recall may be impaired by alcohol consumption (Read et al., 1992 exp.1; Yuille & Tollestrup, 1990). Alternatively recall completeness but not accuracy may be negatively affected by intoxication (Flowe et al., 2016; Harvey et al, 2013a, 2013b; Van Oorsouw & Merckelbach, 2012). The findings of the present study, though, do not support either of these effects of intoxication. Finally, Harvey et al. (2013a, 2013b) found free recall, but not recall on a recognition test was impaired by intoxication. This effect, however, was also not apparent in the present research. With each analysis in the present study indicating a non-significant effect in relation to participant drinking condition, even for participant confidence, the question is raised as to whether the BACs attained within this study were merely insufficient to produce the narrowing of attention proposed by AMT.

Within the current study the average intoxicated participant BAC was .06%. In their real-world study Van Oorsouw and Merckelbach (2012) found that the completeness of a participants' recall was negatively affected by alcohol at these moderate levels of intoxication (M_{BAC} = .06%). However, in their laboratory based research Read et al. (exp. 2; 1992) found higher levels of intoxication (M_{BAC} = .08%) had no detrimental effect on memory performance when compared with placebo participants. The low levels of intoxication produced in the present study, coupled with the laboratory based nature of the research, may therefore offer an explanation as to why no interaction with, or main effect of intoxication was evident. This possibility is supported by the increase in effect size seen when the recognition test recall of intoxicated individuals was restricted to those participants with the highest BACs. Within this analysis, sample size and intoxication level may have merely been insufficient to achieve the power necessary to fully understand the relationship between drinking condition and information salience. Compared to the full sample of 20 intoxicated participants, the five individuals with the highest BACs retained their advantage in relation to the recall of highly salient details, yet their low salience recall improved. This pattern of recall, however, runs contrary to AMT's predictions, as there is no relative neglect of low salience information. Due to the absence of significant main and interaction effects at mean BACs of .06%, the intoxication level of participants should be increased, within the confines of ethics, to determine if the moderate level of intoxication attained in this study was responsible for the lack of effects of intoxication on recall.

Chapter 4: Study 2b: Testing the Validity of Alcohol Myopia Theory with Intoxicated Eyewitnesses at Higher Levels of Intoxication[2]

Abstract

The aim of this study was to investigate whether, with higher levels of intoxication, the pattern of recall impairments predicted by AMT would become apparent. To this end, the design of study 2a was expanded to include a further intoxication condition with a higher alcohol dose (0.8ml/kg; M_{BAC} = .09%). Each participant completed the alcohol procedure detailed in study 2a. In line with the findings of study 2a, when memory was assessed through the recognition test, recall of high salience details was significantly more accurate than low salience recall. However, contrary to the predictions of AMT no effect of drinking condition or interaction between the variables was indicated. The main effect of salience was also apparent in relation to the completeness of participant free recall, but no effect of drinking condition was revealed in regards to either the accuracy or completeness of free recall. Ultimately alcohol does not appear to impair the recall of high and low salience details at the moderate BACs safely attainable within the laboratory. Replicating this research but with increased levels of intoxication and improved forensic relevancy is suggested as a means of further testing the validity of applying AMT to eyewitness recall.

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4.1. Introduction

The results from study 2a revealed that at mean BACs of .06% the recall accuracy and completeness of intoxicated participants was not significantly different from that of sober or placebo individuals. Further to this, and contrary to the predictions of AMT, these levels of intoxication were also not seen to have a particularly impairing effect on the recall of low salience details. However, when analyses were restricted to those intoxicated participants with the highest BACs (M_{BAC} = .08%) an increase in effect size for both drinking condition and interaction with information salience was apparent. As postulated at the end of the preceding chapter it may be that the lack of effect of drinking condition in study 2a was due to the moderate levels of intoxication that were achieved.

The vast majority of the laboratory based traditional alcohol memory research conducted to date (e.g., Grattan–Miscio & Vogel-Sprott, 2005; Paraskevaides et al., 2010; Ray & Bates, 2006; Saults et al., 2007; Schweizer et al., 2005; Söderlund et al., 2005) has examined the effects of low to moderate doses of alcohol which elicit BACs of around .02 - .11%. Whilst cognitive deficits have been found with BACs as low as .03% this has been with the employment of simple cognitive tasks such as recalling word lists and measuring reaction times to stimuli (Breitmeier, Seeland-Schulze, Hecker, & Schneider, 2007; Canto-Pereira, David, Machado-Pinheiro, & Ranvaud, 2007; Clifasefi et al., 2006). Eyewitness testimony, however, involves the recall of complex, important, purposeful and lifelike information. Whilst applied laboratory based research has employed a similar range of intoxication levels, BACs of even .07% have not been sufficient to impair eyewitness's memory (La Rooy et al., 2013). It is therefore proposed that by raising the levels of alcohol consumed by participants and thereby increasing their BAC (to above the drink drive limit for England, Wales and Northern Ireland), intoxication will be seen to have a detrimental effect on recall with this effect being most apparent with low salience details.

Increasing participant BACs to above the drink drive limit for England, Wales and Northern Ireland will also make it possible to examine whether AMT's pattern of recall deficits are revealed at levels of legal intoxication. Previous studies that have examined the effects of BACs above those attained in study 2a have drawn mixed conclusions as to the impairing effects of alcohol. At average BACs of .17% Van Oorsouw and Merckelbach (2012) found alcohol significantly reduced the completeness but not the accuracy of an individual's free recall. Contrary to AMT, it was central, rather than peripheral details that were particularly impaired by intoxication. Van Oorsouw et al. (2015) also found this negative effect of intoxication on recall completeness at average BACs of .16%. Further to this Read et al. (1992; exp. 1) found alcohol (M_{BAC} = .11%) to have a detrimental effect on recall accuracy

and completeness for person, action and environmental context details. Additionally, Yuille and Tollestrup (1990) found BACs of .10% to have a negative effect on overall recall accuracy and completeness. At an average BAC of .08%, though, Schreiber Compo et al. (2011) indicated that intoxication had no effect on an individual's recall completeness of central details but did significantly impair a participant's recall of peripheral information. Yet, at an average BAC of .08% Schreiber Compo et al.'s (2012) research indicated that there was no effect of intoxication on either recall accuracy or completeness. In contrast, at the same mean BACs (.08%), Hildebrand Karlén et al. (2015) found intoxication impaired female participants recall completeness but not accuracy. At a lower mean BAC of .07%, however, alcohol was not seen to affect either the accuracy or completeness of male participants recall. This lack of effect of intoxication on the accuracy and completeness of recall at moderate BACs is supported by the findings of La Rooy et al. (2013; M_{BAC} = .07%) and Hagsand et al. (2013a; M_{BAC} = .04 - .06%). Yet, at lower BACs of .05%, Hagsand et al. (2016) found alcohol to negatively affect free but not cued overall recall completeness, although recall accuracy was not impaired by intoxication in either task. When memory is assessed via a recognition test, however, Flowe et al. (2016) found that whilst a mean BAC of .05% does not affect the accuracy or completeness of central and peripheral recall, a higher degree of intoxication (M_{BAC} = .08%) impaired overall recall completeness but not accuracy. Consequently, this body of research, and the findings of study 2a, suggest that BACs of at least .08% are required to elicit a significant impairment to memory.

Arguably for applied alcohol and memory research to be applicable to the real-world a BAC of .15% or higher may be necessary (Kalant, 1996; White, 2003). Study 1 of this thesis also suggests that police officers consider average intoxicated witness BACs to be between .11 - .18%. Despite the potential need to study higher BACs ethical requirements do not allow such high mean intoxication levels to be attained within this laboratory. Research, however, does also indicate that BACs of approximately .09% and above are sufficient to impair visual and audio processing (Canto-Pereira et al., 2007) as well as attention (Koelega, 1995). Whilst a laboratory based paradigm does not afford the scope to produce BACs as high as .15%, achieving a BAC of at least .08% is possible, and would further our understanding of alcohols effects on recall at legally intoxicated levels.

The aim of this present study was therefore to expand the design of study 2a by adding a further intoxication condition (0.8ml/kg dose) to the existing 3 x 2 design. Due to ethical approval, this was the highest dose that could be administered to participants within the laboratory. The recognition test and free recall task, as per study 2a, were employed to once again assess the validity of Alcohol Myopia Theory. Consistent with the predictions of

study 2a, it was initially hypothesised that participants would have a better recall of high rather than low salience information, irrespective of intoxication level. It was also hypothesised that as per the assertions of AMT, alcohol would impair the free recall and recognition test recall of participants, with items of both low spatial and semantic salience suffering the greatest impairment.

4.2. Method

4.2.1. Participants.

In addition to the original sample of 66 participants from study 2a, a further 22 students took part in current study. Participants were recruited and incentivized as per study 2a. A total of 6 males and 16 females participated with ages ranging from 18-34 years (*M* = 20.09 years, *SD* = 3.66). Age restrictions again ensured participants were not deemed older witnesses (Bornstein et al., 2000; Rose et al., 2003; Wilcock, 2010). As per study 2a, eligibility to participate in the 0.8ml/kg alcohol condition was determined through the use of study 2a's screening form (appendix B). With this increased alcohol dosage condition a total of 88 students (16 males and 72 females) participated with ages ranging from 18-56 years (*M* = 20.92 years, *SD* = 6.22). All participants began the study with a BrAC of 0.00mg/L.

4.2.2. Design.

The addition of an increased alcohol dose to study 2a produced a final study utilizing a 4 (Drinking condition: 0.8ml/kg alcohol dose, 0.6ml/kg alcohol dose, non-alcohol, placebo) x 2 (Information salience: high, low) mixed design with information salience assessed within participants. Drinks were made as per the procedure of study 2a with a 0.8ml dose of ethanol per kg of body weight being mixed with lemonade to make up 450ml of fluid. All drinks were made out of sight of participants and each individual was told that their drink should contain enough alcohol to put them over the drink drive limit. A 0.8ml/kg dose of alcohol was administered for ethical reasons to ensure that, as with most of the alcohol literature, participants BrACs were not significantly higher than 0.35mg/L. In order to reduce the chance of participants using deliberate encoding strategies to remember the stimuli event, participants were not specifically told they would be asked to recall the stimuli event in the second session

4.2.3. Materials.

4.2.3.1. Stimuli Event.

As per study 2a

4.2.3.2. Recognition Test.

As per study 2a

4.2.4. Measures.

Dependent measures of recognition and free recall were as per study 2a. For the free recall of the 22 participants who drank a 0.8ml/kg dose of alcohol, with the same two scorers as study 2a, an inter-rater reliability score of 0.91 was obtained using the Kappa statistic. In terms of free recall, accuracy and completeness scores were calculated as per study 2a. Accuracy was established by dividing the number of correct details reported by the total number of details reported (i.e., correct + incorrect). Measures of memory completeness were obtained by dividing the number of details recalled correctly by the maximum score possible.

4.2.5. Procedure.

The same procedure as study 2a was followed except the dosage of ethanol administered was increased to 0.8ml/kg.

4.3. Results

4.3.1. Breath alcohol concentration.

As in study 2a, whilst participant intoxication was initially assessed through their breath alcohol concentration, all BrACs were converted to BAC with a blood: breath ratio of 2,300: 1. With individuals metabolizing the ethanol at different rates, there was a crossover in the intoxication readings of participants in the 0.6ml/kg and 0.8ml/kg alcohol conditions (0.6ml/kg: BAC range = .03 - .10%; 0.8ml/kg: BAC range = .07 - .11%). Although a significant overall difference in the BACs of participants in these conditions was confirmed ($t(42) = 7.48$, $p < .001$) it was deemed pertinent and of greater ecological validity to regroup the 44 alcohol participants according to their BAC, rather than the quantity of alcohol consumed[3]. Consequently, prior to watching the stimuli event the 21 participants with the highest BAC readings provided samples ranging from .08 - .11% (M = .09%, SD = 0.01). The 23 alcohol participants with the lowest readings provided samples between .03- .07% (M = .06%, SD = 0.01). This participant split ensured low BACs were under the drink drive limit of .08% for England, Wales and Northern Ireland, whilst high BAC participants were at or above this limit. A univariate analysis on participant age did not indicate a significant difference between the new classifications of high BAC (M = 20.19, SD = 3.75), low BAC (M = 19.17, SD = 3.83), non-

[3] Although participants were regrouped according to their BAC, additional analyses with groupings according to alcohol dosage produced the same main/interaction effects for the recognition test and free recall task.

alcohol (M = 23.64, SD = 3.06) and placebo (M = 20.73, SD = 3.54) participants ($F(3, 84) = 2.19$, $p > .05$, $\eta\rho^2 = .07$). In terms of participant gender a chi-square analysis did not indicate a significant interaction with drinking condition ($\chi^2(3, N = 88) = 5.55$, $p > .05$). A further t-test indicated male participant BACs were not significantly different from that of female participants ($t(86) = 1.73$, $p > .05$). A t-test also indicated that the BAC of intoxicated participants at encoding was not significantly different from that at the end of stage one ($t(43) = 0.97$, $p > .05$).

4.3.2. Perceived intoxication levels.

As in study 2a, to confirm the success of the placebo manipulation, a rating of perceived intoxication was taken on a scale of 0-100 (0 = *completely sober* to 100 = *as drunk as you have ever been).* Compared with the placebo (M = 14.18, SD = 14.1) and sober condition (M = 0.00, SD = 0.00), high (M = 45.95, SD = 17.7) and low (M = 39.30, SD = 20.14) BAC participants provided significantly higher ratings of intoxication ($F(3, 84) = 43.59$, $p < .001$). High BAC and low BAC participant ratings, however, were not significantly different from each other ($p > .05$). In addition, no significant correlation was indicated between the perceived intoxication level of high and low BAC participants and their BAC (High: $r_s(21) = .15$, $p > .05$; Low: $r_s(23) = .25$, $p > .05$). Thus, it was concluded the placebo manipulation was moderately successful.

4.3.3. Recognition test.

4.3.3.1. Recognition test responses.

The number of accurate responses given by each participant to the 20 critical statements was calculated and a 2 x 4 mixed ANOVA was conducted. As seen in Table 4.1, irrespective of drinking condition, participants provided a significantly higher number of accurate responses (out of 10) to high salience items (M = 7.52, SD = 1.41) compared to those of low salience (M = 5.18, SD = 1.41) ($F(1, 84) = 115.14$, $p < .001$, $\eta\rho^2 = .58$). Placebo participants recalled the highest number of accurate details overall. Differences were again fairly minimal by salience across drinking conditions, but whilst the high BAC participants provided the fewest accurate responses to high salience details their response accuracy was the greatest for information of low salience. There was, however, no effect of drinking condition ($F(3, 84) = 0.79$, $p > .05$, $\eta\rho^2 = .03$) or interaction with information salience ($F(3, 84) = 0.43$, $p > .05$, $\eta\rho^2 = .02$).

Table 4.1: Means (SDs) of Accurate Recognition Test Responses by Drinking Condition and Information Salience

	High BAC (N = 21)	Low BAC (N = 23)	Non-Alcohol (N = 22)	Placebo (N = 22)	Total
High Salience	7.33 (1.71)	7.39 (1.47)	7.50 (1.34)	7.86 (1.08)	7.52 (1.41)
Low Salience	5.48 (1.44)	5.00 (1.21)	5.09 (1.38)	5.41 (1.62)	5.18 (1.41)
Total	6.41 (1.58)	6.20 (1.34)	6.30 (1.35)	6.64 (1.35)	

4.3.3.2. Recognition test response confidence.

For each statement participants rated their response confidence on a 5 point Likert scale where 1 = *total lack of confidence* and 5 = *total confidence*. Participant confidence ratings for each of the 20 critical statements was analysed by a 2 x 4 mixed ANOVA. The analysis indicated a main effect of salience ($F(1, 84) = 623.74$, $p < .001$, $\eta p^2 = .88$) and as seen in Table 4.2, high salience details ($M = 37.16$, $SD = 5.97$) were recalled with greater confidence than low salience information ($M = 22.17$, $SD = 6.39$). A main effect of drinking condition was also indicated ($F(3, 84) = 3.87$, $p = .01$, $\eta p^2 = .12$), with non-alcohol participants ($M = 29.86$, $SD = 5.64$) being significantly more confident than high BACs ($M = 27.19$, $SD = 5.65$). All other comparisons were non-significant ($p > .05$). No interaction between these variables was highlighted ($F(3, 84) = 1.36$, $p > .05$, $\eta p^2 = .05$).

Table 4.2: Means (SDs) of Total Confidence Ratings by Drinking Condition and Information Salience

	High BAC	Low BAC	Non-Alcohol	Placebo	Total
High Salience	34.52 (6.71)	36.26 (5.31)	39.41 (5.80)	38.36 (5.20)	37.16 (5.97)
Low Salience	19.86 (5.72)	21.74 (5.59)	25.64 (7.04)	21.36 (6.08)	22.17 (6.39)
Total	27.19 (5.65)	29.00 (5.45)	32.52 (5.52)	29.86 (5.64)	

4.3.4. Free Recall.

4.3.4.1. Completeness for high and low salience details as per the recognition test.

As in study 2a, the salience of the free recalled details was determined by whether that detail was deemed to be of high or low salience within the recognition test, thereby taking into account both semantic and spatial definitions of salience. Consequently, details that were recalled but were not classed as high or low salience within the recognition test were again

not coded or analysed. Using the scoring procedure of Yuille and Tollestrup (1990), the higher the free recall scores, the more correct or incorrect units of information recalled.

To ascertain the completeness of the participants' recall, the number of correctly recalled details was divided by the maximum scores possible for each type of information. A maximum score of 26 was possible for high salience details and a maximum score of 24 for low salience details. Whilst low BACs recalled between 3 and 25 correct details *(M* = 12.65, *SD* = 5.80), those participants with high BACs recalled between 1 and 22 correct details (*M* = 11.19, *SD* = 6.07). Non-alcohol participants recalled between 1 and 29 details *(M* = 13.09, *SD* = 5.82) and placebo participants recalled between 3 and 20 *(M* = 12.50, *SD* = 5.02). As seen in Table 4.3, a 2 x 4 mixed ANOVA indicated that participants provided a significantly less complete account in relation to low (*M* = .03, *SD* = .05) as opposed to high salience details (*M* = .45, *SD* = .20) ($F(1, 84) = 473.38$, $p < .001$, $\eta\rho^2 = .85$), with no difference in recall completeness between the four drinking conditions ($F(3, 84) = 0.87$, $p > .05$, $\eta\rho^2 = .03$). No interaction between drinking condition and salience ($F(3, 84) = 1.44$, $p > .05$, $\eta\rho^2 = .05$) was highlighted.

Table 4.3: Mean (SD) Proportion of Correct Free Recalled Details by Drinking Condition and Information Salience

	High BAC	Low BAC	Non-Alcohol	Placebo	Total
High salience	.39 (.19)	.47 (.21)	.48 (.21)	.45 (.18)	.45 (.20)
Low salience	.03 (.05)	.04 (.06)	.02 (.04)	.03 (.04)	.03 (.05)
	.22 (.12)	.25 (.12)	.26 (.11)	.25 (.10)	

For incorrect details, as seen in Table 4.4, few incorrect details were recalled by participants, whilst low BAC participants recalled the most incorrect details. A 2 x 4 mixed ANOVA indicated that participants recalled significantly more incorrect details in relation to high (*M* = 0.45, *SD* = 0.77) as opposed to low (*M* = 0.14, *SD* = 0.38) salience information ($F(1, 84) = 9.62$, $p = .003$, $\eta\rho^2 = .10$). No effect of drinking condition ($F(3, 84) = 0.54$, $p > .05$, $\eta\rho^2 = .02$) or interaction between salience and drinking condition was indicated ($F(3, 84) = 0.62$, $p > .05$, $\eta\rho^2 = .02$).

Table 4.4: Mean (SD) of Incorrect Free Recalled Details by Drinking Condition and Information Salience

	High BAC	Low BAC	Non-Alcohol	Placebo	Total
High salience	0.29 (0.56)	0.53 (0.99)	0.32 (0.89)	0.45 (0.51)	0.45 (0.77)
Low salience	0.10 (0.30)	0.18 (0.49)	0.14 (0.35)	0.14 (0.35)	0.14 (0.38)
	0.39 (0.58)	0.71 (0.19)	0.45 (1.10)	0.59 (0.67)	

4.3.4.2. Accuracy for high and low salience details as per the recognition test.

In line with study 2a, the accuracy of free recall was also analysed. Accuracy rate was established by dividing the number of correct units recalled by the total number of correct and incorrect details remembered. Within each of the drinking conditions there were participants who did not recall any low salience details. Consequently, as in study 2a, analyses of accuracy only looked at the effect of drinking condition, not salience. There were also no confabulations from participants, and as only 11 participants provided subjective details in their written accounts these were subsequently ignored in the analyses. A univariate ANOVA on accuracy rate did not indicate a significant difference between low BAC (M = .95, SD = .10), high BAC (M = .94, SD = .15), placebo (M = .96, SD = .05) and non-alcohol (M = .95, SD = .10) participants ($F(3, 84) = 0.59$, $p > .05$, $\eta\rho^2 = .02$).

4.3.4.3. Recall accuracy and completeness of female participants.

As with study 2a, to explore whether an effect of drinking condition was apparent with only female participants, further analyses were conducted on free recall completeness and accuracy. As the participant sample was still predominately female, and the unequal distribution of male participants across drinking conditions remained (Low BAC = 6; High BAC = 6; Non-Alcohol = 1; Placebo = 3) two analyses (with Bonferroni correction) were conducted with only female participants. A 2 x 3 mixed ANOVA on free recall completeness indicated a main effect of salience ($F(1, 68) = 331.05$, $p < .001$, $\eta\rho^2 = .83$), but as with the full analysis no main effect of drinking condition ($F(3, 68) = 0.25$, $p > .05$, $\eta\rho^2 = .01$) or interaction between these variables was revealed ($F(3, 68) = 1.02$, $p > .05$, $\eta\rho^2 = .04$). For free recall accuracy, a univariate ANOVA did not indicate a significant difference between low BAC, high BAC, non-alcohol and placebo participants ($F(3, 68) = 0.77$, $p > .05$, $\eta\rho^2 = .03$). These findings once again conflict with the conclusions of Hildebrand Karlén et al. (2015), but are consistent with Hagsand et al. (2013a), as recall completeness of women was not impaired by intoxication. The lack of effect of intoxication on recall accuracy, however, is consistent with the conclusions of both Hagsand et al. (2013a) and Hildebrand Karlén et al. (2015).

4.3.5. Results summary.

In summary, when participant recall was assessed using the recognition test, high salience details were recalled more accurately but no effect of drinking condition was apparent. There was also no significant interaction between drinking condition and salience indicated. High BAC participants, however, were less confident in their recall than non-alcohol participants. In terms of free recall, participants were less complete in their recollection of low salience compared with high salience details. However, no significant effect of drinking condition was highlighted in relation to the number of incorrect details recalled, or the accuracy and completeness of participant free recall. As in study 2a, in contrast to the findings of Hildebrand Karlén et al. (2015) but consistent with the conclusions of Hagsand et al. (2013a) no effect of drinking condition was indicated in relation to the free recall completeness of female participants. The lack of effect of intoxication on free recall accuracy for female participants, however, was consistent with the findings of Hagsand et al. (2013a), Hildebrand Karlén et al. (2015) and study 2a.

4.4. Discussion

In light of the findings of study 2a, that alcohol did not significantly affect the recall of high and low salience information at a mean BAC of .06%, the present study raised intoxication levels to above the drink drive level for England, Wales and Northern Ireland (M_{BAC} = .09%). The aim of this study was to once again investigate the effects of alcohol on an eyewitness' recall of high and low salience information. Further to this the study aimed to test the validity of applying AMT to account for the recall pattern of intoxicated witnesses with these higher levels of intoxication. In line with expectations and the findings of study 2a, irrespective of drinking condition participants had poorer recall of low salience information. This effect was evident when memory was assessed through the recognition test and also with free recall

Contrary to the initial hypotheses, alcohol did not significantly impair the accuracy or completeness of an individual's free recall. This lack of effect of intoxication in relation to free recall accuracy supports the findings of previous intoxicated eyewitness studies (Harvey et al., 2013b; Hagsand et al., 2013a, 2016; Hildebrand Karlén et al., 2015; La Rooy et al., 2013; Schreiber Compo et al., 2012) and also the free recall accuracy of intoxicated perpetrators (Van Oorsouw & Merckelbach, 2012). Contrary to the findings of Flowe et al. (2016; M_{BAC} = .08%), but consistent with Harvey et al. (2013b), alcohol was not seen to impair recall accuracy when the memories of participants were assessed through the recognition test. In Flowe et al.'s (2016) research, though, participants had the option to respond 'don't know' to each multiple-choice question which could account for the discrepancy with the present

study. This is supported by the fact that for report accuracy (when don't know responses were excluded) Flowe et al. (2016) found no effect of intoxication. In terms of recall completeness, within the present study, no effect of intoxication was evident up to mean BACs of .09%. Whilst this corresponds to the conclusions of La Rooy et al. (2013) and Schreiber Compo et al. (2011, 2012); in a field study, with mean BACs of .06%, Van Oorsouw and Merckelbach (2012) found alcohol significantly impaired both free and cued recall completeness.

Although not initially hypothesised, whilst previous research suggests that the mere belief that alcohol has been consumed should have led placebo participants to compensate for anticipated recall deficits (Vroom, 1964), this effect was not found in the current study. By paying additional attention to the unfolding event, to counteract any anticipated cognitive deficit, placebo participants should have had significantly more accurate recall than non-alcohol participants. With all analyses indicating non-significant effects for drinking condition, the expectancy effects found by previous research were therefore not found in this study. Research, however, does indicate the difficulty of developing a placebo procedure capable of producing a perceived intoxication level similar to those attained by the alcohol conditions within this study (Rohsenow & Marlatt, 1981). Although the placebo manipulation in the current study was considered successful, there are limits imposed on the quantity of alcohol participants can convincingly be led to believe they have drunk (Martin et al., 1990). The elimination of the placebo condition in future studies should therefore be considered if higher alcohol doses are to be introduced in this thesis.

In regards to AMT and the hypothesised dissociative effects of alcohol on participant's memory of high and low salience details, neither the recognition nor free recall test indicated this interaction. This conflicts with the conclusions of Schreiber Compo et al. (2011) where intoxication (M_{BAC} = .08%) led to poorer recall of peripheral details. One possible explanation for this discrepancy may be the different means by which salience was defined in the two studies. This would suggest that alcohol does affect an individual's ability to recall information depending on what that information pertains to. However, rather than the salience of the information being the deciding factor on whether a detail is likely to be recalled (as proposed by AMT) it is the nature of that item itself, such that material relating to a person is easier to recall than information about the environment. However, the influence of floor effects in the present study, in relation to low salience recall, could also account for the discrepancy with the findings of Schreiber Compo et al. (2011). For even when sober the low salience recall of participants was poor, with some participants failing to recall any of

these details. In addition, as with study 2a, the BAC levels in the current study may have merely been insufficient to produce the impairment to recall predicted by AMT.

Ultimately alcohol does not appear to impair the recall of high and low salience details at the moderate BACs safely attainable within the laboratory. Firstly, studies 2a and 2b should therefore be replicated, but in an environment where the levels of intoxication associated with real-world drinking can be attained (Kalant, 1996; White, 2003). For aside from testing the validity of AMT, in order for this research to be of value to the Criminal Justice System, the BACs attained by participants need to replicate the intoxication levels found in the real-world (Dysart et al., 2002; Evans et al., 2009; Van Oorsouw & Merckelbach, 2012; Van Oorsouw et al., 2015). Secondly, to test whether these real-world levels of intoxication are sufficient to produce the disruption to effortful but not automatic processing typically found in traditional alcohol and memory research (Hasher & Chromiak, 1977; Tracy & Bates, 1999), cognitive processing tasks should also be included. Thirdly, past research suggests that the method of recall, spoken or written, can produce quantitatively and qualitatively different accounts from eyewitnesses (Bekerian & Dennett, 1990; Edwards & Middleton, 1986a, 1986b). These previous studies suggest that although verbal recall may be more repetitive, and less concise than a written recall account, it is also seen to be more accurate. In light of this, and to improve the ecological validity of study 3, verbal recall rather than a written free recall task should be incorporated.

Chapter 5: Study 3: Testing the Validity of Alcohol Myopia Theory with Intoxicated Eyewitnesses at Real-World Levels of Intoxication[4]

Abstract

The purpose of this study was to explore the validity of applying AMT to the recall of intoxicated witnesses with real-world levels of alcohol consumption. To this end, whilst on a night out in the Student Union bar, participants watched the stimuli event of studies 2a and 2b with either high (M_{BAC} = .14%) or low levels M_{BAC} = .05%) of intoxication. A week later, in the laboratory, the recognition test and a verbal free recall task were attempted. High BACs were seen to impair recall completeness when memory was assessed through free recall. It was details of high rather than low salience, however, that were particularly impaired by the increase in intoxication level. For free recall accuracy and recognition test recall no effect of intoxication was indicated. As in studies 2a and 2b, the attention narrowing predicted by AMT was not found using either recall technique, although poor recall for low-salience details in all groups may have contributed to this result. Possible explanations are considered for the differing conclusions of studies 2a and 2b, and study 3 in relation to the completeness of free recall.

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5.1. Introduction

Contrary to the predictions of AMT, the results of studies 2a and 2b showed no interaction between drinking condition and information salience. Further to this, alcohol was not seen to have a significant effect on recall when memory was assessed through either free recall or the recognition test. The lack of effects was apparent even with mean BACs up to .09%. This was unexpected given that previous laboratory research has found alcohol to have a detrimental effect on recall at these BACs (Breitmeier et al., 2007; Canto-Pereira et al., 2007; Clifasefi et al., 2006; Hagsand et al., 2016; Harvey et al., 2013a). However, as previously indicated studies with BACs of .10% and above (Read et al., 1992; Van Oorsouw & Merckelbach, 2012; Van Oorsouw et al., 2015; Yuille & Tollestrup, 1990) have more consistently found alcohol to impair recall. These higher levels of intoxication are also consistent with the BACs that North American police officers and other law officials estimate are typical for intoxicated witnesses (M_{BAC} = .11%; Evans et al., 2009). Additionally, given that the UK's level of alcohol consumption is comparable to that of North America (WHO, 2014); BACs of similar values may be expected within the UK. It is therefore possible that by increasing the intoxication level of participants further, to forensically relevant levels, that the impairment predicted by AMT may become apparent.

Further evidence suggests, though, that in fact BACs of around .15% may be needed, for the conclusions that are drawn from alcohol and eyewitness studies, to be of forensic relevance (Kalant, 1996; White, 2003). At present comparable data is not available in the UK to indicate the degree to which individuals are intoxicated when they witness a crime. Nevertheless, study 1 of this thesis does suggest that officers consider average intoxicated witness BACs to be between .11 - .18%. Whilst previous intoxicated witness laboratory based studies have attained BACs of around .10 -.11% (Read et al., 1992; Yuille & Tollestrup, 1990), due to ethical concerns these higher BACs cannot be achieved in this laboratory. Field studies, however, offer the opportunity to improve the real-world applicability of the findings and study the effects of higher BACs upon witness recall.

Currently, only two field studies have been conducted to look at the recall abilities of an intoxicated individual (Van Oorsouw & Merckelbach, 2012; Van Oorsouw et al., 2015). These studies, however, looked at perpetrator recall and were not conducted in the UK. Within their study Van Oorsouw and Merckelbach (2012) looked at the crime-related memories of individuals who were either sober (BAC < .02%; *M* = .00%), moderately (BAC = .02 – .11%; *M* = .06%) or severely intoxicated (BAC > .11%; *M* = .17%). Patrons in a bar in the Netherlands were approached, breathalysed and asked to watch a video depicting a burglary from a perpetrators perspective. Three to five days later a free and a cued recall task were

completed via email. Recall accuracy and completeness were assessed in relation to both central (perpetrator actions) and peripheral (environment) information. In an assessment of the potential dose-response relationship, BAC was found to be negatively correlated with memory completeness. This relationship was apparent for both central and peripheral details on the cued and free recall tests. Whilst BAC was also seen to be negatively correlated with memory accuracy on the cued and free recall task, it was only through cued recall that a negative correlation between BAC and central and peripheral recall was apparent. In terms of the completeness of free recall, intoxication was seen to reduce the number of details recalled. A significant interaction between degree of intoxication and information centrality was also evident with severe and moderate intoxication impairing central recall. For peripheral details, only severe intoxication resulted in significant recall deficits. Contrary to AMT, however, it was central recall that was particularly impaired by intoxication. In terms of the accuracy of free recall, a main effect of information centrality was indicated, but no main effect of BAC or interaction between the variables was found. For the completeness and accuracy of cued recall, again no interaction was indicated although main effects for BAC and information centrality were apparent.

In a more recent field study in the Netherlands, Van Oorsouw et al. (2015) investigated perpetrator recall and susceptibility to suggestive cues. Within this research, bar patrons with BACs that were either near zero (BAC < .02%; *M* = .01%), moderate (BAC = .02 – .11%; *M* = .06%) or severe (BAC > .11%; *M* = .16%) were provided with a background story and asked to commit a mock theft. Immediately after the crime, participants completed a free and a cued recall task, where they were asked to recall their own actions and the details provided in the background story. In the cued recall task misleading questions were included. As per Gudjonsson (1997), irrespective of the accuracy of their recall, participants were informed that they had made quite a few mistakes and to recomplete the cued recall task. Three to five days later, via the telephone, participants completed the free and cued recall tasks of session one. Although participants were asked to provide a detailed account of their motive for the crime, their actions, the surroundings and the objects seen, no analyses were provided in relation to the types of information recalled.

For the free recall task, analyses of the participant's recall of the enacted theft indicated that severely and moderately intoxicated participants recalled fewer correct details of the theft in both recall sessions than sober individuals. No such difference was indicated between moderately and severely intoxicated participants. There was also no interaction between BAC and recall session. On the cued recall task, intoxication was again seen to reduce the number of correct details recalled compared to sober individuals, but an

interaction was also apparent. In session one, severely intoxicated individuals recalled fewer correct details of the theft than both moderately intoxicated and sober participants. In session two, though, only the correct recall of severely intoxicated individuals was impaired. In terms of the participant's free recall of the background story, an effect of intoxication level was found with alcohol significantly reducing the number of correct details recalled between the three intoxication conditions. On the cued recall task, no effect of BAC was apparent, and on both the free and cued recall task no interaction between BAC and recall session was indicated. In addition, no effect of BAC was found on the number of incorrect details recalled in any analysis. In terms of susceptibility to suggestive cues, only severely intoxicated individuals were seen to yield to misleading questions more often than sober participants.

Due to the lack of field studies in the UK which have explored the effect of alcohol on eyewitness recall, the present study aimed to replicate studies 2a and 2b in an environment where the higher levels of intoxication typically associated with real-world drinking are attained (Kalant, 1996; White, 2003). This study would firstly provide an indication of the degree of intoxication typically experienced in the real-world. Secondly, the research would also indicate the extent to which an individual's recall was affected by real-world intoxication levels above those achieved in studies 2a and 2b. The recall of high and low salience details, as defined in studies 2a and 2b, was also examined with a view to once again assess the validity of AMT to account for the recall pattern of an intoxicated individual. To corroborate the extent of impairment suffered by participants as a result of alcohol consumption, two word processing tasks (free recall and a word frequency estimation task) were added. These tests would assess whether the levels of intoxication were sufficient to produce the disruption to effortful, but not automatic processing typically found in traditional alcohol and memory research (Hasher & Chromiak, 1977; Tracy & Bates, 1999). Additionally, as previous research suggests that spoken and written recall tasks can generate quantitatively and qualitatively different accounts from eyewitnesses (Bekerian & Dennett, 1990; Edwards & Middleton, 1986a, 1986b), a verbal rather than a written free recall task was incorporated. This would also improve the ecological validity of the study and more effectively mimic the process of a police interview.

Considering these aims, together with the predictions of AMT and the conclusions of Van Oorsouw and Merckelbach (2012), and also Van Oorsouw et al. (2015) it was initially hypothesised that individuals, irrespective of their level of intoxication, would have a better recall of high rather than low salience details. With regards to intoxication level, it was hypothesized that high BACs at encoding would result in greater impairments in the memory of stimuli event details when recalled sober. Finally, in line with AMT, it was predicted that

this deficiency for high BACs would be greatest for low salience elements, compared with low BAC participants. Such a distinction was not anticipated between BAC levels for high salience details.

5.2. Method

5.2.1. Participants.

Based on a priori power analysis to obtain statistical power at the recommended .80 level (f = .25, α = .05; Cohen, 1988), as was discussed previously in section 1.4.4 Experimental Power; a new sample of 54 undergraduate volunteers (76% female) participated with ages ranging from 18 – 23 years (M = 19.5, SD = 1.27). A further four undergraduates viewed the initial stimuli event but did not return to complete stage two of the study. Potential participants were recruited and incentivised as per studies 2a and 2b but were also given free entry to the Student Union (SU) bar. Each student also completed the same comprehensive screening process to determine their eligibility as in studies 2a and 2b (appendix B).

5.2.2. Design.

The study utilized a 2 (BAC condition: high BAC, low BAC) x 2 (Information salience: high, low) mixed design with salience being assessed within participants. Although participants were randomly allocated to an interview condition, random allocation was not possible for the drinking condition without modifying the participants' normal drinking behaviour. Two further tests were introduced to confirm that the BACs achieved were sufficient to provide disruption to effortful but not automatic processing: number of words recalled and mean estimated frequency of words presented multiple times. Due to ethical requirements, participants were informed that a task in the session would be recorded by dictaphone. In order to reduce the chance of participants using deliberate encoding strategies to remember the stimuli event, however, participants were not specifically told they would be asked to recall the stimuli event in the second session.

5.2.3. Materials.

5.2.3.1. Automatic and effortful recall task.

For the assessment of automatic and effortful processing, a free recall and word frequency estimation task was produced based on the work of Tracy and Bates (1999) and the procedure of Hasher and Chromiak (1977). Four lists of 90 words were constructed with 27 unique words within each list. The words were chosen to be high in both mental imagery (> 6.0 on a scale of 1–7, Paivio, Yuille, & Madigan, 1968) and frequency in the English language (> 50 occurrences per million; Thorndike & Lorge, 1944) as per Tracy and Bates (1999). The

unique words were repeated at different frequencies with four presented once, five presented twice, six presented three times, six presented four times, three presented five times, two presented six times, and one presented seven times as per Tracy and Bates (1999). An example of the word lists and the estimation task can be seen in appendix H.

5.2.3.2. Stimulus event.

As per studies 2a and 2b.

5.2.3.3. Recognition test.

As per studies 2a and 2b.

5.2.4. Measures.

Dependent measures of recall within the recognition test and free recall task were the same as in studies 2a and 2b. In regards to the scoring of free recall, with the same two scorers as studies 2a and 2b (who were blind to participant BAC), an inter-rater reliability score of .94 was obtained using the Kappa statistic. Two further dependent measures were produced to confirm that the BACs achieved were sufficient to provide disruption to effortful but not automatic processing: number of words recalled and mean estimated frequency of words presented multiple times. As per studies 2a and 2b, measures of free recall accuracy and completeness were calculated. Accuracy was established by dividing the number of correct details reported by the total number of details reported (i.e., correct + incorrect). Measures of memory completeness were obtained by dividing the number of details recalled correctly by the maximum score possible.

5.2.5. Procedure.

Prior to stage one, in line with ethical requirements, all participants completed the screening form (appendix B) to ascertain their eligibility to participate.

Stage 1: On the day of the study, whilst sober, participants were informed that during their night out they would be asked to complete a couple of tasks and would watch a video. They were asked to sign the consent form (appendix I) if they agreed to continue. Participants were also instructed to engage in their normal drinking behaviour during their night out at the SU bar, namely that whether a student typically drank alcohol or not then this was fine and would not affect their ability to participate. Participants were told, however, that if they did decide to drink alcohol then not to do so for 20 minutes prior to their allotted appointment time. This protocol would ensure the breathalyser produced an accurate BrAC as recommended by the breathalyser manufacturer guidelines (Lion Laboratories UK, 2015).

Stage 2: During their evening out in the SU bar, participants were met by the

researcher at the pre-arranged time and taken to a quiet room to complete stage 2 of the study. Participants were initially asked to confirm that they had not consumed alcohol for the previous 20 minutes and then to detail the quantity and type of all beverages drunk that evening. Those that had not abstained from drinking alcohol in the previous 20 minutes were required to wait 20 minutes before providing a breath sample. A subjective measure of intoxication was also taken as per studies 2a and 2b. Participants were then randomly allocated to one of the four word lists (see an example in appendix H). The selected 90 words were read aloud to participants in a random order at a presentation rate of one every two seconds. At completion, participants were breathalysed again and asked to recall as many of the words as possible (effortful processing task), before estimating the frequency with which the 27 unique words were presented (automatic processing task). Participants then proceeded to watch the stimuli event, before and after which they were breathalysed. This second stage lasted between 25 and 45 minutes depending on how long participants abstained from alcohol before they took part. At the end of stage 2 participants returned to the SU bar to continue with their evening.

Stage 3: A week later, during the day, participants arrived at a separate venue and stage 2 of studies 2a and 2b was followed. The only exception was that the written free recall task was replaced with a verbal free recall task which was recorded by dictaphone. Participants were asked to recall 'as much information as you can remember from the video you saw last week, no matter how small or trivial you think those details may be. Additionally, please include any information you can recall in relation to the actions and appearance of the man, and his environment. There is no time limit to this task'. After the free recall task was complete, the recognition test (appendix C) was attempted. In contrast to studies 2a and 2b if participants had absolutely no memory of the details a particular statement was referring to then they were told to respond true or false, and select a confidence rating of 1. For those questions that participants had some recall of (no matter how small) then they responded true or false as appropriate and their confidence rating scale began at 2. Once both recall tasks were completed participants were given the debrief sheet (appendix G) and any questions and queries were answered.

5.3. Results

5.3.1. Breath alcohol concentration.

As in studies 2a and 2b, participant intoxication was initially assessed through their breath alcohol concentration, but all BrACs were converted to BAC with a blood: breath ratio of

2,300: 1. Participants reportedly consumed between 2.7 and 28 units of alcohol[5] (M = 10.84, SD = 6.74), resulting in BACs ranging from .01 - .23% (M = .10%, SD = .06). There was a highly positive correlation between units consumed and BAC (r (54) = .51, $p < .001$). Using the mean of the four BACs produced by each individual during stage two, participants were divided in to those with high and low BACs. The 26 participants in the low BAC condition generated readings between .01 - .07% (M = .05%, SD = .02), whilst those providing higher BACs ranged from .08 - .23% (M = .14%, SD = .04). This split ensured that low BACs were below the drink drive limit for England, Wales and Northern Ireland, whilst high BACs were at or above this drink drive limit. A significant difference in the intoxication level of the two BAC conditions (t(52) = 10.31, $p < .001$) confirmed the distinct nature of these two populations. A univariate analysis on participant age did not indicate a significant difference between the classifications of high (M = 19.75, SD = 1.30) and low BAC (M = 19.23, SD = 1.21) participants (F(1, 52) = 2.31, $p > .05$, $\eta p^2 = .14$). A chi-squared analysis of participant gender also did not indicate a significant interaction with drinking condition (χ^2(1, N = 54) = 2.07, $p > .05$). A further t-test indicated that the BAC of male participants was not significantly different from that of female participants (t(52) = 1.06, $p > .05$).

5.3.2. Word recall and estimation task.

T-tests confirmed impairment in effortful processing with high BAC individuals recalling significantly fewer words (M = 6.04, SD = 2.47) than low BAC participants (M = 9.77, SD = 2.80) (t(52) = 5.20, $p < .001$). As anticipated, automatic processing abilities were preserved with the mean estimated word frequency provided by participants not being significantly different for the two BAC conditions (High: M = 1.85, SD = 1.27; Low: M = 1.71, SD = 0.92) (t(52) = 0.49, $p > .05$). The levels of intoxication achieved were therefore sufficient to replicate previous research (Hasher & Chromiak, 1977; Tracy & Bates, 1999) demonstrating a detrimental effect of intoxication on effortful but not automatic processing.

5.3.3. Recognition test.

5.3.3.1. Recognition test responses.

A 2 x 2 mixed ANOVA conducted on recognition test responses indicated a main effect of salience, where, as seen in Table 5.1, participants provided significantly fewer accurate answers (out of 10) in relation to low (M = 5.80, SD = 1.51) compared with high salience details (M = 7.04, SD = 1.18) (F(1, 52) = 40.84, $p < .001$, $\eta p^2 = 0.34$). High BAC participants (M = 6.21, SD = 1.43), however, did not provide significantly fewer accurate responses than low

[5] The highest number of units was consumed by a participant claiming to have drunk 750ml of rum and 8 shots of vodka

BAC individuals (M = 6.64, SD = 1.48) ($F(1, 52) = 4.76$, $p > .05$, $\eta p^2 = 0.04$). Additionally, no significant interaction was indicated between BAC and information salience ($F(1, 52) = 1.30$, $p > .05$, $\eta p^2 = 0.02$).

Table 5.1: Means (SDs) of Accurate Recognition Test Responses by BAC condition and Information Salience

	High BAC (N = 28)	Low BAC (N = 26)	Total
High Salience	6.96 (1.26)	7.12 (1.71)	7.04 (1.18)
Low Salience	5.46 (1.77)	6.15 (1.08)	5.80 (1.51)
Total	6.21 (1.43)	6.64 (1.48)	

With no interaction indicated between salience and BAC, in relation to the recognition test, a further exploratory analysis was conducted on recognition test responses, where participants provided a confidence rating of 1. Within the present study participants were told that if they had absolutely no memory of the details a particular statement was referring to then they were to respond true or false and select, a confidence rating of 1. In this situation, regardless of whether an individual elected to reply true or false, their answer was entirely a guess. If participants had some recall of the statements details (no matter how small) then they responded true or false and their confidence rating scale began at 2. To explore whether BAC condition affected the number of statements to which participants had no recall of the details, all responses (whether correct or incorrect) were rescored as 'don't know' if the corresponding confidence rating was 1. This meant that the two alternative forced choice test (2AFC) was recoded to a three alternative forced choice test (3AFC). The latter, researchers indicate, is more sensitive to changes in an individual's response, as it does not make the participant guess (.i.e. produce false alarms) (Marvit Florentine & Buus, 2003).

Using the frequency of 'correct', 'incorrect' and 'don't know' responses a three-way log-linear analysis examined any association between BAC condition, decision type and salience. This produced a final model that retained the BAC x Decision Type, and Salience x Decision Type interactions. The likelihood ratio of this model was $\chi^2(3) = 4.82$, $p > .05$ with both BAC x Decision Type ($\chi^2(2) = 19.68$, $p < .001$) and Salience x Decision Type ($\chi^2(2) = 120.85$, $p < .001$) interactions being significant. Chi-squared analyses indicated a significant association between BAC and decision type ($\chi^2(2, N = 54) = 19.51$, $p < .001$). As seen in Table 5.2, low BACs provided significantly more correct decisions ($p < .001$) and significantly fewer don't know responses than high BACs ($p < .001$). With regards to incorrect decisions there was no difference between high and low BACs ($p > .05$). Further Chi-squared analyses also

indicated a significant association between information salience and decision type (χ^2 (2, N = 54) = 118.31, $p < .001$), with high salience details resulting in significantly more correct decisions ($p < .001$), and significantly less 'don't know' responses ($p < .001$) than low salience details. There was no difference in the number of incorrect decisions between high and low salience information ($p > .05$).

Table 5.2: Percentage of Recognition Test Responses by BAC condition and Decision Type

		Incorrect	Correct	Don't know	Total
Low BAC	Low Salience	10.96	20.58	18.46	50
	High Salience	13.27	31.73	5.00	50
	Total	24.23	52.31	23.46	100
High BAC	Low Salience	10.36	13.93	25.71	50
	High Salience	10.89	29.11	10.00	50
	Total	21.25	43.04	35.71	100

5.3.3.2. Recognition test response confidence.

With a confidence rating of 1 equating to no memory of a detail, the Likert confidence ratings were recoded from a scale of 1-5, to 1-4 (so previous ratings of 2 were recoded to 1, 3 recoded to 2 etc.). A 2 x 2 mixed ANOVA conducted on this revised scale indicated a main effect of salience ($F(1, 52) = 294.54$, $p < .001$, $\eta p^2 = 0.85$) and BAC ($F(1, 52) = 9.93$, $p = .003$, $\eta p^2 = 0.16$) with, as seen in Table 5.3, high salience details being recalled with greatest confidence (High: $M = 22.78$, $SD = 7.09$; Low: $M = 10.87$, $SD = 6.61$), and low BACs having the most confidence in their responses (High: $M = 14.39$, $SD = 6.41$; Low: $M = 19.45$, $SD = 6.40$). No interaction was indicated between these variables ($F(1, 52) = 1.30$, $p > .05$, $\eta p^2 = 0.02$).

Table 5.3: Means (SDs) of Total Confidence Ratings by BAC Condition and Information Salience (Out of 40)

	High BAC	Low BAC	Total
High Salience	19.96 (6.80)	25.81 (6.18)	22.78 (7.09)
Low Salience	8.82 (6.01)	13.08 (6.62)	10.87 (6.61)
Total	14.39 (6.41)	19.45 (6.40)	

5.3.4. Free recall.

5.3.4.1. Completeness for high and low salience details as per the recognition test.

The interviews for all 54 participants were transcribed. As with studies 2a and 2b, the salience of the free recalled details was determined by their classification as high or low salience within the recognition test. Consequently, details that were recalled but were not classed as high or low salience within the recognition test were again not coded or analysed. Using the scoring procedure of Yuille and Tollestrup (1990), the higher the free recall scores, the more correct or incorrect details were recalled. A maximum score of 26 was possible for high salience details and a maximum score of 24 for low salience details. Whilst low BACs recalled between 1 and 24 correct details (M = 11.38, SD = 5.72), those with high BACs recalled between 1 and 18 correct details (M = 6.79, SD = 4.89). As seen in Table 5.4, a 2 x 2 mixed ANOVA indicated that participants recall was significantly less complete in relation to low salience (M = .04, SD = .05) compared to high salience details (M = .31, SD = .19) ($F(1, 52) = 149.91$, $p < .001$, $\eta p^2 = 0.74$). Higher levels of intoxication (M = .14, SD = .09), resulted in significantly less complete recall overall than low BACs (M = .23, SD = .11) ($F(1, 52) = 10.29$, $p = .002$, $\eta p^2 = 0.17$). A significant interaction was also indicated, with low BACs having the most complete recall irrespective of salience, and the recall completeness of high salience details being particularly impaired when BAC levels increased from low to high ($F(1, 52) = 5.78$, $p = .02$, $\eta p^2 = 0.10$). Whilst high salience recall completeness was reduced by 15% as BACs increased there was only a 4% reduction in low salience recall.

Table 5.4: Mean (SD) Proportion of Correct Free Recalled Details by BAC Condition and Information Salience

	High BAC	Low BAC	Total
High Salience	.24 (.18)	.39 (.19)	.31 (.19)
Low Salience	.02 (.08)	.06 (.06)	.04 (.05)
	.14 (.09)	.23 (.11)	

For incorrect details, as seen in Table 5.5, across BAC condition and information salience participants recalled very few incorrect details. A 2 x 2 mixed ANOVA indicated that participants recalled significantly more incorrect details in relation to high (M = 0.85, SD = 1.03) as opposed to low salience information (M = 0.25, SD = 0.52) ($F(1, 52) = 19.03$, $p < .001$, $\eta\rho^2 = .27$). No effect of BAC condition ($F(1, 52) = 2.02$, $p > .05$, $\eta\rho^2 = .04$) or interaction between salience and BAC condition was indicated ($F(1, 52) = .08$, $p > .05$, $\eta\rho^2 = .002$).

Table 5.5: Mean (SD) of Incorrect Free Recalled Details by BAC Condition and Information Salience

	High BAC	Low BAC	Total
High Salience	1.00 (1.22)	0.70 (0.80)	0.85 (1.03)
Low Salience	0.39 (0.63)	0.11 (0.33)	0.25 (0.52)
	1.39 (1.47)	0.81 (0.52)	

5.3.4.2. Accuracy for high and low salience details as per the recognition test

As with studies 2a and 2b, free recall accuracy was also analysed across BACs but not across salience as there were participants within both BAC groups who did not recall any low salience details. An independent t-test did not indicate a significant difference in the recall accuracy rate of high (M = .84, SD = .30) and low BAC (M = .94, SD = .08) participants (t(30.47) = 1.72, p > .05). Whilst a high BAC participant recalled the only fabricated piece of information it was low BAC participants in contrast who provided the greater amount of subjective information (Low: M = 2.46, SD = 1.36; High: M = 1.43, SD = 1.37) (t(52) = 2.77, p = .01) with variations on 'the man was acting suspiciously' being their most frequently repeated detail.

5.3.4.3. Recall accuracy and completeness by gender.

As previous research (Hildebrand Karlén et al., 2015), suggested that the recall completeness of women, but not men, was negatively affected by intoxication, further analyses were conducted. As in studies 2a and 2b a majority of participants in this study were female. In addition, an initial examination of the data indicated that the completeness and accuracy scores of male participants were not normally distributed. Due to the small sample of male participants (N = 13) and the issues of skewness, Field (2009) recommends conducting Kolmogorov-Smirnov Z tests, which tend to have better power than the Mann-Whitney test. In terms of recall completeness, male participants with high BACs (M = .17, SD = .04; Mdn = .11) were significantly less complete than those with low BACs (M = .21, SD = .13; Mdn = .40) (Z = 1.48, p = .02, r = - .73). High BAC female participants (M = .12, SD = .08; Mdn = .10) were also significantly less complete than those with low BACs (M = .24, SD = .12; Mdn = .25) (Z = 1.80, p = .003, r = -.49). For male participants, low BAC accuracy (M = .95, SD = .06; Mdn = 1.00) was not significantly different from the accuracy of high BACs (M = .87, SD = .13; Mdn = 1.00) (Z = .74, p > .05, r = -.05). This lack of effect was also apparent with female participants where low BAC accuracy (M = .91, SD = .10; Mdn = 1.00) was not significantly different from high BACs (M = .84, SD = .15; Mdn = 1.00) (Z = .96, p > .05, r = -.03).

In regards to recall accuracy, the lack of effect of BAC for both male and female participants in the present study is consistent with the findings of both Hagsand et al. (2013a) and Hildebrand Karlén et al. (2015). For recall completeness, however, although the effect of BAC for female participants is consistent with the findings of Hildebrand Karlén et al. (2015), the effect of BAC for male participants is not consistent. Further to this, as in the present study, Hagsand et al. (2013a) found intoxication to have the same effect on the completeness of an individual's recall irrespective of whether they were male or female. Within the present study, however, this effect of intoxication was to reduce recall completeness, whilst for Hagsand et al. alcohol did not impair the completeness of an individual's recall.

5.3.5. Results summary.

In summary, when memory was assessed through the recognition test, recall of low BAC participants was not significantly better than those with high BACs. However, when 'don't know' responses were taken in to consideration high BACs were seen to have the weaker memory of the video as they provided significantly more 'don't know' responses than low BACs. This analysis also indicated that irrespective of BAC condition, participants had poorer recall for low salience details. Finally, when memory was assessed through free recall, the fewest details recalled were those of low salience, with high BAC individuals providing a significantly less complete account of the event. Higher levels of intoxication were also seen to particularly impair recall for high rather than low salience details. In addition, there was no significant difference in the free recall accuracy rates of high and low BAC participants and no effect of intoxication in relation to the number of incorrect details recalled. Consistent with the findings of Hildebrand Karlén et al. (2015) and Hagsand et al. (2013a) no effect of BAC was apparent for the recall accuracy of male or female participants. In terms of recall completeness, intoxication was seen to impair the recall of both genders. This lack of a dissociative effect of gender on recall completeness is consistent with the findings of Hagsand et al. (2013a), but conflicts with the conclusions of Hildebrand Karlén et al. (2015). However, unlike the present study, Hagsand et al. (2013a) found alcohol did not impair recall completeness compared to sober individuals.

5.4. Discussion

In light of the findings of study 2a and 2b, that alcohol did not significantly affect the recall of high and low salience information at the BAC levels safely attainable in the laboratory (M_{BAC} = .09%), the present study assessed recall with higher real-world levels of intoxication (M_{BAC} = .14%). It was initially hypothesised that, as with studies 2a and 2b, participants would have poorer recall of low compared with high salience information,

irrespective of BAC condition. This effect was apparent on both the recognition test and free recall task. It was also predicted that high BACs (i.e., at or above the drink drive limit for England, Wales and Northern Ireland) at encoding would result in greater impairments in the memory of stimuli event details when recalled sober. In contrast to the predictions of AMT and this hypothesis, but consistent with the conclusions of studies 2a and 2b, when recall was assessed through the true/false recognition test, the memories of those individuals with high BACs were not seen to be significantly poorer than those with low BACs (i.e., below .08%). The introduction of the 'don't know' response option, however, provided some support for the hypothesis. With high BAC participants providing more 'don't know' responses than low BAC participants, it appears they had more gaps in their memory. It should be noted, however, that although a 3AFC test is more sensitive to changes in a person's response than a 2AFC test, the recoding of a 2AFC to a 3AFC is not typically employed in psychological research. This is therefore a weakness in relation to the 'don't know' exploratory analysis. The detrimental effect alcohol appears to have on high BACs on the recognition test, is supported by the free recall analysis where, in agreement with the findings of Van Oorsouw and Merckelbach (2012), participants at or above the drink drive limit for England, Wales and Northern Ireland (M_{BAC} = .14%) provided a significantly less complete account than those with low BACs (M_{BAC} = .05%). The negative effect of intoxication is also consistent with the findings of Van Oorsouw et al. (2015) where, on the free recall task, severely intoxicated participants (M_{BAC} = .17%) recalled fewer details of the background story than moderately intoxicated individuals (M_{BAC} = .06%). When recalling their actions as a thief, however, Van Oorsouw et al. found severely intoxicated individuals did not recall significantly fewer details than a moderately intoxicated individual. As already indicated, though, Van Oorsouw et al. (2015) looked at the actions of a perpetrator. The present study and the research of Van Oorsouw and Merckelbach (2012) in contrast looked at the recall of an individual who had witnessed a crime, from either a witness' or a perpetrators perspective, but were not the perpetrator themselves. The discrepancy in the findings of Van Oorsouw and Merckelbach (2012), Van Oorsouw et al. (2015) and the present study may therefore be a consequence of the distinction between perpetrator and 'witness'.

In line with the propositions of AMT, it was finally hypothesised that the recall deficiency associated with high BACs would be greatest for low salience details, compared with low BACs. Whilst the true/false recognition test did not support this hypothesis, when assessing memory via the free recall task an interaction between BAC condition and information salience was apparent. It was the recall completeness of high rather than low salience information, though, that intoxication had the most detrimental effect upon. This

latter finding corresponds to the conclusions of Van Oorsouw and Merckelbach (2012) where the recall of central details (perpetrator actions) was particularly undermined by alcohol on the free recall task. Consequently, the findings of the present study and studies 2a and 2b do not indicate the narrowing of attention proposed by AMT. Instead the research suggests that the BACs safely attainable in the laboratory (M_{BAC} = .09%), namely those just over the drink drive limit, are not sufficient to impair an individual's recall for a complex and forensically relevant event. This lack of effect held irrespective of whether memory was assessed through the accuracy and completeness of free recall or the true/false recognition test. However, with real-world levels of intoxication, where BACs at nearly double the drink drive limit were achieved M_{BAC} = .14%), recall deficits were clearly apparent when memory was assessed via the completeness of free recall and also to a lesser degree with the recognition test.

In the present study, when memory was assessed through the more ecologically valid verbal free recall task, low BAC participants were seen to have the more complete memory, in that they remembered the sequence of events that occurred and the specifics of those details. High BAC participants in contrast appeared to have more sketchy recall, with a higher proportion of details being forgotten entirely. In the most extreme cases, participants recalled no low salience details of the video at all. This is further supported by the 'don't know' recognition test response analysis where, compared with low BAC participants, those with BACs at or above the drink drive limit forgot significantly more of the event details. These conclusions are in line with the work of Van Oorsouw and Merckelbach (2012), where high levels of intoxication (M_{BAC} = .17%) resulted in less complete recall of the crime, irrespective of whether a cued or free task was utilised. In contrast, Schreiber Compo et al. (2012) found that, with free recall intoxicated participants did not provide significantly more 'don't know' comments than sober participants. For intoxicated participants, however, the recall task in the latter study was completed whilst they were still intoxicated and this may account for the discrepancy in the findings.

In terms of free recall, although high BACs in the present study resulted in fewer correct details being recalled there was not a significant difference in incorrect recall. Despite this studies 2a, 2b and the present study found no significant effect of intoxication on recall accuracy up to mean BACs of .14%. Further to this, even when 'don't know' responses were taken into account on the recognition test high BAC participants did not provide more incorrect responses. These conclusions are in line with those drawn by Van Oorsouw and Merckelbach (2012) who found intoxication did not affect the accuracy of an individual's free recall. Further to this Van Oorsouw et al. (2015) also found intoxication did not affect the number of incorrect details recalled.

Regarding AMT, Steele and Josephs (1990) proposed that due to an individual's limited processing capacity when alcohol is consumed, a person focuses on the high salience items and consequently their recall for the less salient elements suffers. This pattern of recall deficits was not found with the free recall task of studies 2a and 2b, nor was it found with the recognition tests of studies 2a, 2b or the present study. Further to this Van Oorsouw and Merckelbach (2012) also did not find alcohol to have the particularly detrimental effect on low salience recall that is predicted by AMT. In the free recall task of the present study, though, an interaction between BAC condition and information salience was indicated. In contrast to the predictions of AMT and the findings of Schreiber Compo et al. (2011), however, it was information of high rather than low salience that suffered the greater impairment when high BACs were experienced. Consequently, this significant interaction between BAC condition and information salience does not follow the pattern of recall impairment initially hypothesised in this current research, and predicted by AMT. Within these present studies, however, the influence of floor effects in relation to the recall of low salience information needs to be considered. Participants' recall of the low salience information was particularly poor with some individuals not recalling any of these details. As a result, this limits the ability of this study to draw firm conclusions regarding the attention narrowing effect associated with alcohol consumption that is proposed by AMT. Other factors including no random assignment of participants to BAC condition in the present study, and a change in interview format could also have contributed to the different findings of the present study and studies 2a and 2b.

Aside from these factors there are a number of other possible explanations for the disparate findings in this research and the predictions of AMT. As was initially reported, Van Oorsouw and Merckelbach (2012) defined the observed actions of the participant (in the role of the perpetrator) as being of high salience, and environmental details were deemed of low salience. Studies 2a, 2b and the present study adopted a less 'type' specific distinction when determining the salience of information, and took into account both semantic meaning and spatial location. This methodology therefore considered AMT's assertion that the salience of a detail is not determined solely by its type/nature or spatial location but rather its role in the unfolding event. With a significant interaction indicated between information salience and BAC within the present study's free recall task, there is some support for the use of this more complex definition of salience, when studying the AMT with intoxication witnesses. Van Oorsouw and Merckelbach though suggest that fragmentary blackouts may account for their findings, rather than the choice of what constitutes salience.

A fragmentary blackout results in an intoxicated individual recalling some, but not all, of the details they experienced whilst intoxicated (Goodwin, 1977). A person only becomes aware that they have gaps in their memory when they are informed there are details they do not remember. Small to moderate fragmentary blackouts, research indicates, can occur with a rapid rate of alcohol consumption and potentially with BACs of .15% (Mintzer & Griffiths, 2002; Ray & Bates, 2006; Ryback, 1971). Whilst the present study achieved BACs close to this (M_{BAC} = .14%), no significant effect of intoxication was found with the use of the recognition test, however, an effect was found with free recall. If a fragmentary blackout caused gaps in an intoxicated participant's memory, then their recall would be expected to be poorer irrespective of how memory was assessed; by free recall or recognition test.

An alternative explanation concerns the phenomenon of acute alcohol amnesia (see Goodwin, Crane, & Guze, 1969; Hashtroudi & Parker, 1986), where recall impairments can become apparent at BACs as low as .08% (Birnbaum et al., 1978; Carpenter & Ross, 1965; Hashtroudi, Parker, DeLisi, & Wyatt, 1983; Jones & Jones, 1980). In contrast to blackouts, where the amnesia is fatal (i.e., the memory may be permanently lost), the effects of acute alcohol amnesia are subtler and the memory to some extent can be retrieved with appropriate cues and prompts (Goodwin, Crane, et al., 1969; Hashtroudi & Parker, 1986). Such an effect would explain why the recognition test failed to find an alcohol induced impairment to memory in the present study, as the statements prompted and reminded the participants of the details they failed to remember in the free recall task. Alternatively, the cues in the recognition test may have been sufficient to access the weaker memory trace that was not sufficiently strong enough to be accessible via free recall.

There is some support for this explanation of deficits for intoxicated recall. During debrief discussions participants frequently indicated that they experienced degrees of surprise, annoyance and exasperation at themselves when completing the recognition test. They had suddenly remembered details that they had no recollection of when completing the free recall task. This tentatively suggests that the memories an intoxicated individual has available to them may be more extensive than those details they can readily access without cues and prompting. In addition to this anecdotal evidence, alcohol research has shown that whilst intoxication regularly impairs the free recall of word lists, the impairment of recognition memory is less consistent (Curran & Hildebrandt, 1999; Duka et al., 2001; Hashtroudi et al., 1984). Similar findings have been reported with drugs such as ketamine (Fletcher & Honey, 2006). Ultimately this would mean the effect of alcohol concerns the accessibility of the memories rather than their availability (Tulving, 1983; Tulving & Pearlstone, 1966). An individual may retain memories of an event they witnessed whilst

intoxicated, but the issue is how to access them without negatively affecting the accuracy of what is recalled.

Within studies 2a and 2b, encoding and recall occurred in the same location and no effect of intoxication was apparent. In the present study, however, encoding and recall occurred in separate locations and high BACs were seen to be less complete in their free recall. Although there was also an increase in intoxication levels between the studies, it may be that participants in studies 2a and 2b engaged in spontaneous context reinstatement to aid their recall. In light of this possibility, techniques such as the Cognitive Interview (CI, Geiselman, Fisher, MacKinnon, & Holland, 1985) or the Enhanced Cognitive Interview (ECI, see Fisher & Geiselman, 1992) may therefore prove useful in helping intoxicated witnesses access memories that are not readily available.

From a criminal justice perspective, the present study indicates that those witnesses with BACs at or above the drink drive limit for England, Wales and Northern Ireland are likely to have gaps in their memory which, when they are interviewed, may prevent them from providing as complete an account of the event than a more sober witness. With studies 2a and 2b indicating that the BACs ethically achievable in the laboratory are insufficient to significantly impair recall; future alcohol and eyewitness research should be conducted in the real-world, where higher BACs may be achieved. The introduction of a sober condition would also enable conclusions to be drawn as to what recall deficits are the result of alcohol, and what are the consequences of general shortfalls in witness recall. The employment of the (E)CI in the recall phase would also provide a valuable insight into whether the gaps in the memory of an intoxicated individual are the result of a fragmentary blackout, restricted attention, or even acute alcohol amnesia. Considering this, study 4 should explore to what extent, if any, the (E)CI can be used to improve the recall of an intoxicated witness.

Chapter 6: Study 4: Improving Intoxicated Eyewitness Recall with the Enhanced Cognitive Interview

Abstract

The aim of this study was to investigate whether the Enhanced Cognitive Interview (ECI), as administered by police officers in England and Wales, to witnesses of less serious crimes, namely the full ECI minus 'change perspective' and 'temporal order', had the capacity to improve the recall of an intoxicated witness compared to a Structured Interview (SI). To this end sober, moderately (M_{BAC} = .05%) and severely intoxicated (M_{BAC} = .14%) participants watched the stimuli event whilst on a night out in the Student Union bar. A week later, in a separate location, participants completed either the SI or modified ECI procedure. The 'report everything' and 'mental reinstatement of context' mnemonics of the ECI were seen to significantly improve the correct recall as well as the accuracy and completeness of both moderately and severely intoxicated participants. Moderately intoxicated witnesses, however, were no less accurate or complete than sober individuals, and did not recall fewer correct details. Severely intoxicated witnesses, though, recalled significantly fewer correct details and were less complete although no less accurate than sober witnesses. The findings of this study are discussed in relation to acute alcohol amnesia, the accessibility and availability of memories, and the ability of the ECI to improve the recall of real-world intoxicated witnesses.

6.1. Introduction

In contrast to the predictions of AMT, in studies 2a, 2b and 3, with mean BACs up to .14%, alcohol was not seen to particularly impair witness recall of low salience details. Real-world levels of intoxication in study 3, however, were seen to reduce free recall completeness but not accuracy. Although previous research (Van Oorsouw & Merckelbach, 2012) suggests that this effect may be the consequence of fragmentary blackouts, it was postulated at the end of the preceding chapter that perhaps acute alcohol amnesia was a better explanation for alcohols effect on recall. A fragmentary blackout explanation of alcohol's effect on recall would consider there to may be some failure in the process of consolidating the memory, such that the event or detail is forgotten. Although an individual may be informed that there are details they do not remember, they still cannot recall them first-hand (Goodwin, 1977). An acute alcohol amnesia explanation, however, would expect these details to be retrievable, to some extent, with appropriate cues and prompts.

As stated previously when participants were completing the recognition test they indicated that they had suddenly recalled details that they had no recollection of when completing the free recall task. This suggests that participants had more memories of the stimuli event available to them than they could readily access, without cues and prompts. The difficulty lies in providing witnesses with these cues and prompts without jeopardising the integrity of what they recall. As detailed in the previous chapter, the CI (Geiselman et al., 1985) may be one means of aiding intoxicated witnesses in retrieving these details from their memory. This interview technique consists of four interview mnemonics based upon multiple trace theory (e.g., Bower, 1967; Wickens, 1970) coupled with the encoding specificity principle (Tulving & Thomson, 1973).

Multiple trace theory suggests that memory is viewed as a complex network of associations where ultimately information that is not available through one recall method may be available through another. As a result, the CI incorporates the four mnemonics of 'report everything', 'change temporal order', 'change perspective' and 'mental reinstatement of context'. The final mnemonic, 'mental reinstatement of context' is based on the encoding specificity principle (Tulving & Thomson, 1973) which suggests that the effectiveness of a recall method is enhanced when the contextual information at encoding is also present at retrieval (Geiselman et al., 1985). As indicated in the discussion of chapter 5, within studies 2a and 2b, participants encoded and recalled the stimuli event within the same location (or context) with no effect of intoxication being indicated. However, in study 3 encoding and recall occurred in separate locations and intoxication was seen to affect the free recall completeness of participants. Although other differences between studies 2a, 2b and 3 (e.g.,

BAC increase and change of recall method) may account for these findings it is also possible that in studies 2a and 2b participants used context reinstatement spontaneously to aid their memory. If this is the case then the 'mental reinstatement of context' mnemonic of the CI may prove beneficial in providing witnesses with the necessary cues and prompts to aid their recall, without affecting the reliability of their testimony.

From the original CI, the Enhanced Cognitive Interview (ECI) was developed (see Fisher & Geiselman, 1992). This interview technique contained the same four mnemonics as the CI and placed them in a phased structure along with a number of other components (e.g., rapport building and witness compatible questioning), based on principles from memory research and the social psychology of communication (see Milne & Bull, 1999). Research indicates the (E)CI can increase the amount of correct information recalled by approximately 35-40% compared to a standard or a structured interview (Clifford & George, 1996; Fisher, Geiselman, & Amador, 1989; Geiselman et al., 1984; Köhnken, Thürer, & Zoberbier, 1994). This effect has been found irrespective of the interviewee's age (Akehurst, Milne, & Köhnken, 2003; Holliday & Albon, 2004; Mantwill, Köhnken, & Aschermann, 1995; Mello & Fisher, 1996; Milne, Clare, & Bull, 1999; Wright & Holliday, 2007) or the interviewers' experience (Geiselman, Fisher, MacKinnon, & Holland, 1986; Köhnken et al., 1994; Mantwill et al., 1995). Although some studies have also found a small increase in the amount of incorrect information recalled with the (E)CI, this effect is neither as large nor as consistent as the increase in correct information, and is not considered sufficient to affect the overall accuracy rate (Köhnken, Milne, Memon, & Bull, 1999; Memon, Meissner, & Fraser, 2010).

Field tests of the (E)CI have also indicated that police officers who are trained to use the techniques of this interview method obtain more information and greater detail from witnesses (Clifford & George, 1996; Fisher et al., 1989; Kebbell & Milne, 1998). Such is the reliability of this interview technique that it is tested and used in many countries around the world including Australia (e.g., Davis, McMahon, & Greenwood, 2005), Brazil (e.g., Stein & Memon, 2006), Canada (e.g., Snook, Eastwood, Stinson, Tedeschini, & House, 2010), Germany (e.g., Köhnken et al., 1994), Portugal (e.g., Paulo, Albuquerque, Saraiva, & Bull, 2015) and the USA (e.g., Brock, Fisher, & Cutler, 1999). In England and Wales all police officers are trained in a number of components of the (E)CI including 'report everything', 'mental reinstatement of context', 'rapport building', 'transfer control to the witness', 'focused retrieval' and 'witness compatible questioning' (Boon & Noon, 1994; Dando, Wilcock, Behnkle, & Milne, 2011; Mello & Fisher, 1996). Furthermore, the UK advise that vulnerable witnesses be interviewed using the (E)CI (where beneficial), including those made vulnerable through their use of alcohol and/or drugs (MoJ, 2011).

Despite this, research suggests that novice (Dando, Wilcock, & Milne, 2009) and less experienced police officers (Dando, Wilcock, & Milne, 2008) view some aspects of the (E)CI as less effective than others and consequently use them less frequently. For example, 'change perspective' and 'change temporal order', have been found to be the least applied (Clarke & Milne, 2001; Dando et al., 2009) and least useful components of the (E)CI (Dando et al., 2008; Kebbell, Milne, & Wagstaff, 1999), with both components not eliciting any more correct details than a witness merely being told to 'try again' (Milne & Bull, 2002). Research also suggests, however, that the combination of 'report everything' and 'mental reinstatement of context' results in significantly more correct details than any of the individual mnemonics (Milne & Bull, 2002). Consequently, studies have explored the efficacy of an (E)CI procedure that eliminates 'change perspective' and 'temporal order', as per the procedures administered by police officers in England and Wales. Compared to the full (E)CI, the modified (E)CI procedure does not significantly affect the number of correct or incorrect details recalled, but does reduce confabulations and increases recall accuracy (Dando et al., 2011).

To date, the effect of alcohol on eyewitness recall, elicited through an (E)CI, has not been examined. Research has examined intoxicated perpetrator (Read et al., 1992), and intoxicated witness recall (Schreiber Compo et al., 2011) whilst adopting some elements of the original CI, although it is not entirely clear which components were used in both studies. Across two studies, Read et al. (1992) explored the effects of alcohol on a perpetrators recall of a robbery. A week after committing the staged theft, Read et al. asked these, now sober, perpetrators to verbally recall the robbery "within a cognitive interview" (p. 430). However, Read et al. provide very few details for this interview other than stating that the interview instructions provided participants with four primary recommendations for enhancing recall, as per the four mnemonics of the CI. Whether participants were guided through these mnemonics by the interviewer, or left to choose which, if any, mnemonic to employ is unclear. Nevertheless intoxication (M_{BAC} = .11%) was seen to reduce perpetrator recall accuracy and completeness for person and environment details as well as the perpetrators own actions, when compared to sober perpetrators. Alcohol was seen, though, to have the most detrimental effect on the recall of person details. Yet these significant effects of intoxication were not evident in the second study when perpetrator BAC was reduced (M_{BAC} = .08%) and recall was compared to placebo perpetrators. Although Read et al.'s research, to some degree, incorporates the mnemonics of the CI, there was no comparison with other recall methods, it was perpetrator not witness recall that was explored and not all participants were breathalysed to confirm their BACs. Consequently, it is not possible to

determine the extent to which the interview method may have aided intoxicated witness recall.

In a more recent study, examining alcohols effect on an individual's memory for a long and interactive event, Schreiber Compo et al. (2011) randomly assigned participants to an alcohol, placebo or control group. Within the researchers' simulated bar-lab, participants consumed their beverages and an hour later, whilst still intoxicated, were moved to a separate room and given written instructions on how to complete a written free recall test. Within these instructions participants were asked to 'mentally reinstate' the original encoding environment. Further to this, participants were also encouraged to 'report everything'. Compared to placebo and control participants, intoxication (M_{BAC} = .09%) was found to have no effect on the number of correct central (i.e., person) or incorrect peripheral (i.e., scenario) details recalled, but did significantly reduce correct peripheral recall. Consequently, alcohols effect on recall was not to increase the amount of false information recalled but to reduce the amount of correct peripheral details reported. Ultimately Schreiber Compo et al. indicated that this pattern of recall impairments is in line with the propositions of AMT.

As with Read et al. (1992), the purpose of Schreiber Compo et al.'s (2011) study was not to test whether the CI (or its components) could improve the recall of an intoxicated individual. As such there was no comparison recall method, and it is not possible to determine the extent to which the 'report everything' and 'mental reinstatement' instructions aided recall. Further to this, participants were given written instructions and completed a written free recall task, rather than completing a more forensically relevant full verbal interview. Consequently, additional components of the ECI, such as 'rapport building' and 'witness compatible questioning', as applied by police officers, were not incorporated. Furthermore, participants were interviewed within an hour of finishing their beverages, so individuals who had consumed alcohol were still intoxicated when they completed the recall task. As a result, the findings of Schreiber Compo et al.'s study are likely to have been confounded by the effects of state-dependency (Goodwin, Powell, et al., 1969; Parker et al., 1976; Weissenborn & Duka, 2000). Whilst this methodology may mimic the witness' initial and immediate account to the police, the actual testimony presented at court will be taken when the witness is sober as indicated by police officers in study 1. The effect alcohol has on the individual's memory between the time of the crime and when they provide their actual testimony is consequently unknown from Schreiber Compo et al.'s (2011) research.

Historically studies have included a standard interview as the comparison group within their research. In more recent years, however, this has been replaced with a more

effective control condition, the Structured Interview (SI) (see Memon et al., 2010). A standard interview reflects how officers traditionally interviewed witnesses when employing some of the techniques recommended for police interviewers (MoJ, 2011), but may include for example, closed and leading questions (see Köhnken et al., 1994). A Structured Interview in contrast includes the social facilitative techniques of the ECI but excludes the four mnemonic components. The inclusion of the SI, within this present study, will therefore enable a direct test of the ECI, in order to determine whether the cognitive techniques of 'mental reinstatement of context' and 'report everything', rather than the social facilitative factors of the ECI, can improve the recall of intoxicated witnesses. Consequently, within this study, the SI and ECI procedures would be identical, other than that the SI would not include, the 'mental reinstatement of context' and 'report everything' mnemonics of the ECI.

Within their research Schreiber Compo et al. (2011) defined salience according to information type (see section 1.4.5. Alcohol Myopia Theory), with person details being considered central and scenario details (i.e., descriptions of the surroundings) deemed peripheral. Read et al. (1992) also employed this item type approach to coding the recall of participants according to whether the details pertained to actions/events, person, objects or environmental details. These classifications conflict with the definition of salience that has been applied throughout this thesis, where both a details spatial location and semantic meaning were taken into account. In adopting this more encompassing definition of salience, studies 2a, 2b and 3 of this thesis have not found alcohol to be particularly detrimental to recall accuracy, or the recall completeness of high or low salience details (up to M_{BAC} s of .09%). This obviously contrasts to the findings of Schreiber Compo et al. (2011) where, as per AMT, when alcohol (M_{BAC} = .08%) was consumed central recall was maintained but peripheral recall was impaired. The spatial location and semantic definition of salience applied in this thesis, however, cannot be used to determine the salience of all details within the stimuli event, as not all details will be consistently classified as high or low salience for both spatial location and semantic meaning. Considering this, and in line with previous research into the effects of alcohol on recall (Flowe et al., 2016; Hagsand et al., 2013a, 2016; Read et al., 1992; Schreiber Compo et al., 2011; Van Oorsouw & Merckelbach, 2012; Yuille & Tollestrup, 1990), and also consistent with studies investigating the (E)CI (e.g., Dando et al. 2011; Maras & Bowler, 2010; Memon et al., 2010), details recalled by participants within the present study will be coded as surrounding information, objects, actions or person details, as opposed to the salience definition applied in studies 2a, 2b and 3.

The aim of the present study was therefore to investigate whether the form of ECI administered by police officers in England and Wales, namely the full ECI minus 'change

perspective' and 'temporal order', has the capacity to improve the recall of an intoxicated witness compared to a Structured Interview. In light of the findings of previous research with sober witnesses (Clifford & George, 1996; Fisher et al., 1989; Geiselman et al., 1984; Köhnken et al., 1994), it was firstly hypothesised that recall elicited through the ECI would be more accurate (overall) than the SI, due to more correct details being recalled. Secondly, within study 3 it was indicated that alcohol intoxication reduced free recall completeness but not accuracy. Similar findings have been found in earlier intoxicated forensic recall studies (Flowe et al., 2016; Hagsand et al., 2016; Hildebrand Karlén et al., 2015; Van Oorsouw & Merckelbach, 2012) and also 'basic' memory research (Koriat, Goldsmith, & Pansky, 2000). It was therefore also hypothesised that intoxication would reduce the completeness but not the accuracy of an individual's testimony. Thirdly, it was hypothesised that an interaction between drinking condition and interview type would be apparent with the ECI particularly improving the recall of those individuals who were severely intoxicated. Finally, it was hypothesised that, due to the narrowing of attention proposed by AMT and in line with the findings of Schreiber Compo et al. (2011), intoxication would result in fewer correct surrounding details being recalled leading to a significantly less complete recall of these details.

6.2. Method

6.2.1. Participants.

Whilst a total of 126 undergraduates viewed the initial stimuli event, only 120 of these individuals (79% female) returned to complete stage two of the study. Participant ages ranged from 18 – 32 years (M = 19.58, SD = 2.03). Although a priori power analysis indicated that a sample size of 269 participants was required to obtain statistical power of at least the recommended .80 level (f = .25, α = .05; Cohen, 1988), as was discussed previously in section 1.4.4 Experimental Power; this, however, was not possible within the constraints of this thesis. A total of 120 participants, however, ensured 20 participants in each condition, which is not dissimilar to previous (E)CI research where participants per condition can be as low as eight (Akehurst et al., 2003; Maras & Bowler, 2010; Memon et al., 2010). A post-hoc power analysis indicated that for an independent design study of 120 participants power was .38 (f = .25, α = .05; Cohen, 1988). All student volunteers were recruited and incentivised as per study 3 and completed the same screening process (appendix B). Prior to the study, participants signed the study information and consent form (appendix I) and at study completion were provided with a debrief form (appendix K).

6.2.2. Design.

The study utilized a 3 (Drinking condition: sober, moderately intoxicated, severely intoxicated) x 2 (Interview condition: ECI, SI) independent design. As in study 3, although participants were randomly allocated to an interview condition, random allocation was not possible for the drinking condition without modifying the participants' normal drinking behaviour. Dependent measures of free recall were obtained using a scoring template technique (Memon, Holley, Wark, Bull, & Köhnken, 1996; Memon, Wark, Holley, Bull, & Köhnken, 1997) and guided by the work of Dando et al. (2011). Details recalled by participants in the verbal free recall task were coded as correct, incorrect or a confabulation. Accuracy scores were also calculated by dividing the number of correct details reported by the total number of details recalled (i.e., correct + incorrect + confabulation). Measures of memory completeness were obtained by dividing the number of details recalled correctly by the maximum score possible. The particulars of how the data were coded are presented below under 'scoring'. In addition, interview duration was recorded. As per study 3, two further dependent measures were tested to confirm the disruption to effortful but not automatic processing. This was assessed through a free recall and word frequency estimation task respectively. Due to ethical requirements, participants were informed that a task in the second session would be recorded by dictaphone. In order to reduce the chance of participants using deliberate encoding strategies to remember the stimuli event, however, participants were not specifically told they would be asked to recall the stimuli event in the second session.

6.2.3. Materials.

6.2.3.1. Automatic and effortful recall task

As per study 3.

6.2.3.2. Stimulus event.

As per studies 2a, 2b and 3.

6.2.3.3. Interview schedules.

A strict interview protocol was adhered to depending on the condition to which participants were randomly allocated: ECI or SI (Fisher & Geiselman, 1992; Milne & Bull, 2001). These protocols were prepared for previous research (Dando et al., 2011) by an experienced CI interviewer and were read verbatim to participants (see appendix J). Each interview had six discrete phases (1) greet and personalise the interview, (2) rapport building, (3) explain the purpose of the interview, (4) free recall, (5) questioning, and (6) closure. The only difference

between the ECI and SI schedule was in phase four. Structured Interview participants, after receiving an instruction not to guess, merely provided a free recall account of the stimuli event. The ECI participants, however, were aided in 'mentally reinstating context' and were given the instruction to 'report everything' but to never guess, before they began their free recall. All participants were given two recall attempts; phase four (free recall) and phase five (questioning) as per Dando et al. (2011). The SI provided a good control condition as it only differed from the ECI in terms of the two mnemonics and therefore allowed direct comparison between the two interview methodologies as in previous research (Maras & Bowler, 2010; Milne at al., 1999).

As in previous (E)CI research (e.g., Dando et al., 2011; Maras & Bowler, 2010) all participants were interviewed by the first author. Within phase one, participants were welcomed, reminded that they had previously consented to have this task recorded, and asked to confirm this. Participants were also given the opportunity to ask any questions. During phase two, rapport was built between the interviewer and the participant, where neutral topics of mutual interest were discussed. Once the participant had visibly relaxed the purpose of the interview was made explicitly clear in phase three and any questions asked were answered. In phase four, those in the ECI condition were aided in mentally reinstating both the physical and psychological context under which they watched the event, before being given the instruction to report everything they remembered but not to guess. Those in the SI condition were merely asked to recall what they remembered from the film and not to guess. All participants then provided their initial free recall account. During phase five participants had a second opportunity to recall details of the event when asked open questions about each of the main topics mentioned during the initial free recall. For example; "you mentioned that a laptop was stolen, could you tell me more about that please?" In accordance with witness compatible questioning, questions were asked in the same order that the participant mentioned each topic during their free recall. The closure of the interview happened in phase six where participants were thanked for their help with the study and were debriefed (appendix K) as to the purpose of the research.

6.2.4. Procedure.

Prior to stage one, in line with ethical requirements, all participants completed the screening form (appendix B) to ascertain their eligibility to participate.

Stage 1: As per study 3, stage 1.

Stage 2: As per study 3, stage 2.

Stage 3: A week later (as per Akehurst et al., 2003; Evans & Roberts, 2009; Stein & Memon, 2006), during the day, participants arrived at a different venue (to avoid spontaneous context

reinstatement) and were breathalysed to confirm a BrAC of 0.00mg/L, and randomly allocated to either the ECI or SI condition. All interviews were recorded via dictaphone for later transcription and coding. At the end of the interview participants were debriefed (appendix K) as to the purpose of the study and any questions were answered.

6.2.5. Scoring.

The recorded interviews were transcribed and then coded according to a scoring template technique by Memon et al. (1996) and guided by the work of Dando et al. (2011). Consistent with previous ECI research (Dando et al., 2011; Maras & Bowler, 2010), a comprehensive list of the details in the video was constructed incorporating descriptions of the perpetrator, objects, surroundings, and actions resulting in 312 items of information. Although, in order to test AMT, studies 2a, 2b and 3 applied a definition of salience that took into account both spatial location and semantic meaning, this was not possible within the present study. This was primarily due to the fact that not all details in the stimuli event could be consistently classified as of high or low salience for both semantic meaning and spatial location. Further to this, semantic meaning was only determined for the 20 critical statements of the recognition test, not every detail seen within the stimuli event. Consequently, an item 'type' definition of salience was applied in this present study.

With only a copy of the participants' recall, and not the full interview, the researcher was blind to the drinking and interview condition of each transcript. To test hypothesis four and the assertions of AMT, these recalled items were also classified according to information type (as detailed above). For example, 'a man with brown hair was in a classroom. He picked up a laptop and put it in a bag' would be coded as 7 correct points (2 person, 1 surrounding, 2 action, and 2 objects). Each detail recalled was coded as correct, incorrect or a confabulation (i.e., recalling a detail or action that did not happen) by the researcher. If a detail was repeated within a single interview phase or over two phases, then this item was only scored once and the repetition ignored unless additional details were provided. If a participant mentioned a detail but included a qualifying statement such as "I'm not sure if" or "I think that" then the detail itself was coded and the fact that the participant was unsure was ignored. In which interview phase each detail was initially recalled was also coded. Twenty-four interview transcripts (20%) were randomly selected (four in each drinking and interview condition) and independently scored by a second individual who was blind to the aims and hypotheses of the study and therefore also the drinking and interview condition of the transcript. Pearson correlations of the two coders' scores suggested good inter-rater reliability for the three memory measures; total correct: $r(24) = .92$, $p < .001$, total incorrect: $r(24) = .90$, $p < .001$ and total confabulations: $r(24) = .85$, $p < .001$.

6.3. Results

Initially, BrACs and recall from the effortful and automatic tasks were analysed to confirm the distinct nature of the three drinking conditions. In addition, a further analysis was undertaken to look at the effect of drinking condition on interview duration. The effect of interview type and drinking condition on participant memory was also investigated in terms of the number of correct, incorrect and confabulations recalled and also recall accuracy and completeness. Each of these analyses was repeated for detail type (action, object, person and surrounding) and interview phase (free recall and questioning). Initial explorations of the data highlighted one severely intoxicated SI participant (M_{BAC} = .10%) that did not recall any information from the video. With no recall details to code, this participant was removed from all further analyses. Subsequent statistical tests were run with the remaining 119 participants.

6.3.1. Breath alcohol concentration.

As in studies 2a, 2b and 3, participant intoxication was initially assessed through their BrAC, but converted to BAC with a blood: breath ratio of 2,300: 1. Participants who drank alcohol during their night out (N = 79) reportedly consumed between 3.30 and 24.20 units of alcohol[6] (M = 8.73, SD = 4.39), resulting in BACs ranging from .01 - .21% (M = .09%, SD = .05). There was a highly positive correlation between reported units consumed and BAC (r (79) = .53, p < .001). Using the mean of the four BACs produced by each intoxicated individual (as in study 3) participants were divided into those above and those below the drink drive limit of .08% for England, Wales and Northern Ireland. The 40 participants who were classed as moderately intoxicated generated readings between .01 and .07% (M = .05%, SD = .02), whilst the 39 who were classed as severely intoxicated had BACs ranging from .08 to .21% (M = .14%, SD = .03). Analyses of the BAC reading confirmed the distinct nature of these two intoxicated populations (t(77) = 13.97, p < .001). A univariate analysis on participant age did not indicate a significant difference between sober, moderately intoxicated and severely intoxicated participants (F(2, 113) = 0.93, p > .05, $\eta\rho^2$ = .02) or between the ECI and SI interview condition (F(1, 113) = 0.63, p > .05, $\eta\rho^2$ = .01). In terms of participant gender a chi-square analysis did not indicate a significant interaction with drinking condition (χ^2(2, N = 119) = 1.00, p > .05) or interview type (χ^2(1, N = 119) = 0.17, p > .05). A further t-test indicated that the BAC of male participants was not significantly different from that of female participants (t(117) = 0.54, p > .05).

[6] The highest number of units was consumed by a participant claiming to have drunk 750ml of 22% vodka and 568ml of beer.

6.3.2. Word recall and estimation task.

A univariate ANOVA confirmed impairment in effortful processing, with severely intoxicated (*M* = 6.85, *SD* = 2.61) and moderately intoxicated individuals (*M* = 9.75, *SD* = 3.14) both recalling significantly fewer words than sober (*M* = 11.90, *SD* = 3.19) participants ($F(2,116) = 28.30$, $p < .001$, $\eta\rho^2 = .33$). A significant difference was also indicated between moderate and severely intoxicated participants ($p = .001$). As anticipated, automatic processing abilities were preserved with the mean difference between the presented frequency of words and the estimates provided by participants not being significantly different for severely intoxicated (*M* = 1.66, *SD* = 0.45), moderately intoxicated (*M* = 1.55, *SD* = 0.30) and sober individuals (*M* = 1.56, *SD* = 0.64) ($F(2,116) = 0.76$, $p > .05$, $\eta\rho^2 = .01$). The levels of intoxication achieved were therefore sufficient to replicate previous research (Hasher & Chromiak, 1977; Tracy & Bates, 1999) and demonstrate a detrimental effect of intoxication on effortful but not automatic processing. Further t-tests confirmed there was no significant difference in the recall of the SI and ECI participants' conditions for the effortful ($t(117) = 1.31$, $p > .05$) or automatic processing task ($t(117) = 0.67$, $p > .05$). Thus suggesting that any benefit derived from the ECI was not a consequence of the generally superior memory of participants in the ECI condition.

6.3.3. Interview duration.

The duration of the interview was measured from the beginning of the witnesses' first free recall attempt until they provided their last detail of information, ensuring omission of all instructions given to participants and the 'context reinstatement' and 'report everything' elements of the ECI. A 2 (Interview type) x 3 (Drinking condition) univariate ANOVA indicated a main effect of interview type with ECI recall (*M* = 4 mins 37 secs, *SD* = 2 mins 7 secs) taking significantly longer than the SI (*M* = 3 mins 52 secs, *SD* = 1 min 45secs), ($F(1, 113) = 6.44$, $p = .01$, $\eta\rho^2 = .05$). A main effect of drinking condition was also revealed ($F(2, 113) = 21.85$, $p = .01$, $\eta\rho^2 = .28$), with post-hoc tests indicating the interview duration of sober participants was significantly longer (*M* = 5 mins 34 secs, *SD* = 2 mins 8 secs) than both moderately (*M* = 4 mins, *SD* = 1 min 45 secs) and severely intoxicated *(M* = 3 mins 7 secs, *SD* = 1 min 5 secs) participants ($p < .001$). No such difference was indicated between the duration of moderately and severely intoxicated participant interviews ($p > .05$). No interaction between drinking condition and interview type was revealed ($F(2, 113) = 1.42$, $p > .05$, $\eta\rho^2 = .02$).

6.3.4. Overall recall performance.

To test hypotheses one, two and three, overall recall performance was assessed. The means and standard deviations for the number of correct, incorrect and confabulated details

recalled by participants, as well as accuracy and completeness are shown in Table 6.1. With there being a significant difference in the duration of the SI and ECI conditions, it is possible that interview duration may have influenced the effect of interview on the five dependent variables. An initial MANCOVA was therefore conducted on recall completeness and accuracy as well as correct, incorrect and confabulated recall, with interview duration as a covariate. This procedure is consistent with previous research (e.g. Dando et al., 2011; Maras & Bowler, 2010). Using Pillai's trace indicated a significant effect of interview duration ($V = .54$, $F(4, 109) = 31.52$, $p < .001$, $\eta\rho^2 = .54$) and interview type ($V = .19$, $F(4, 109) = 6.42$, $p < .001$, $\eta\rho^2 = .19$) but not drinking condition ($V = .12$, $F(8, 220) = 1.67$, $p > .05$, $\eta\rho^2 = .06$). Follow-up univariate ANOVAs on the outcome variables revealed the covariate, interview duration, was significantly related to the number of correct ($F(1, 112) = 88.10$, $p < .001$, $\eta\rho^2 = .44$) and incorrect details recalled ($F(1, 112) = 62.05$, $p < .001$, $\eta\rho^2 = .36$) as well as for recall completeness ($F(1, 112) = 88.01$, $p < .001$, $\eta\rho^2 = .44$). No effect was found for confabulations ($F(1, 112) = 1.47$, $p > .05$, $\eta\rho^2 = .02$), or accuracy ($F(1, 112) = .01$, $p > .05$, $\eta\rho^2 = .001$). Consequently, subsequent analyses were performed with interview duration as a covariate for correct and incorrect recall, and for completeness only.

To investigate recall performance ANCOVAs were conducted with correct, incorrect and completeness as the dependent variables. Separate ANOVAs were also conducted with confabulations and recall accuracy as the dependent variables. Although incorrect and confabulated recall was low, and indicative of a floor effect, there was a reasonable distribution of scores and no issues in relation to skewness. For both the ANCOVAs and ANOVAs a reduced α level of 0.01 was employed by applying Bonferroni's correction and significant results were explored by Bonferroni post-hoc tests. In contrast to the predictions of hypothesis three, across all five measures of recall no interactions between interview type and drinking condition were indicated ($p > .05$). As can be seen in Table 6.1, the completeness of participant recall was rather low irrespective of drinking condition and interview type but in contrast recall accuracy was very good even for severely intoxicated participants.

Table 6.1: Means (SDs) of Overall Recall Performance and Interview Duration Across Drinking Condition and Interview Type

	Sober	Moderately	Severely	Total
SI				
Correct	47.00 (13.02)	33.00 (16.70)	22.26 (12.22)	34.29 (17.23)
Incorrect	7. 45 (4.06)	5.05 (3.66)	4.37 (2.89)	5.64 (3.76)
Confabulations	1.65 (1.93)	1.10 (1.21)	1.26 (1.41)	1.34 (1.54)
Accuracy	.84 (.08)	.83 (.12)	.78 (.15)	.81 (.12)
Completeness	.15 (.04)	.11 (.05)	.07 (.04)	.11 (.06)
Duration	4m 49s (1m 38 s)	3m 49s (1m 57s)	2m 54s (1m 4s)	3m 52s (1m 45s)
ECI				
Correct	57.80 (18.19)	45.15 (19.62)	31.60 (15.69)	44.85 (20.64)
Incorrect	6.40 (3.99)	4.25 (2.83)	3.60 (1.96)	4.75 (3.22)
Confabulations	0.90 (1.21)	0.60 (1.19)	1.00 (1.38)	.83 (1.25)
Accuracy	.89 (.05)	.91 (0.05)	.85 (.08)	.89 (.07)
Completeness	.19 (.06)	.14 (.06)	.10 (.05)	.14 (.07)
Duration	6m 19s (2m 20s)	4m 13s (1m 34s)	3m 20s (1m 4s)	4m 37s (2m 7s)
Total				
Correct	52.40 (16.54)	39.08 (19.00)	27.05 (14.70)	
Incorrect	6.93 (4.01)	4.65 (3.26)	3.97 (2.46)	
Confabulations	1.28 (1.63)	.85 (1.21)	1.13 (1.38)	
Accuracy	.87 (.07)	.87 (.10)	.82 (.12)	
Completeness	. 17 (.05)	.13 (.06)	.09 (.05)	
Duration	5m 34s (2m 8s)	4m 0s (1m 45s)	3m 7s (1m 5s)	

6.3.4.1. Correct recall.

In line with hypothesis one a significant effect of interview condition was revealed with more correct details being recalled with the ECI (M = 44.85, SD = 20.64) than the SI (M = 34.29, SD = 17.23) ($F(1, 112) = 6.37$, $p = .01$, $\eta\rho^2 = .05$). The ECI increased correct recall by 22.98% for sober, 36.82% for moderately intoxicated and 41.96% for severely intoxicated individuals. Analyses also indicated a significant effect of drinking condition ($F(2, 112) = 4.90$, $p = .009$, $\eta\rho^2$

= .08) with sober individuals recalling significantly more correct details (*M* = 52.40, *SD* = 16.54) than severely intoxicated participants (*M* = 27.05, *SD* = 14.70) ($p = .009$). No significant differences were revealed between sober and moderately (*M* = 39.08, *SD* = 19.00) ($p > .05$), or moderately and severely intoxicated participants ($p > .05$).

6.3.4.2. Incorrect recall.

No significant effect of interview type was revealed in relation to the number of incorrect details recalled ($F(1, 112) = 2.06$, $p > .05$, $\eta\rho^2 = .01$). Neither was there a significant effect of drinking condition in the number of incorrect details given by sober, moderately, or severely intoxicated individuals ($F(2, 112) = 0.32$, $p > .05$, $\eta\rho^2 = .01$).

6.3.4.3. Confabulations.

No significant effect of interview type was indicated on the number of confabulations participants recalled ($F(1, 113) = 3.81$, $p > .05$, $\eta\rho^2 = .03$). In addition, there was no effect of drinking condition indicated in relation to the number of confabulated details recalled by sober, moderately or severely intoxicated individuals ($F(2, 113) = 0.94$, $p > .05$, $\eta\rho^2 = .02$).

6.3.4.4. Accuracy.

As predicted in hypothesis one, the ECI significantly improved recall accuracy (*M* = .89, *SD* = .07) when compared to the SI (*M* = .81, *SD* = .12) ($F(1, 113) = 17.32$, $p < .001$, $\eta\rho^2 = .13$). The recall accuracy of sober individuals interviewed with the ECI was 5.95% higher than those interviewed with the SI. For severely intoxicated participants this difference was 8.97% and for moderately intoxicated individuals the difference was 9.64%. In accordance with hypothesis two, no significant effect of drinking condition was indicated ($F(2, 113) = 4.00$, $p = .02$, $\eta\rho^2 = .07$) between sober (*M* = .87, *SD* = .07), moderately (*M* = .87, *SD* = .10) or severely intoxicated participants (*M* = .82, *SD* = .12) on the accuracy of their recall.

6.3.4.5. Completeness.

The ECI significantly improved recall completeness (*M* = .14, *SD* = .07) compared to the SI (*M* = .11, *SD* = .06) ($F(1, 112) = 6.37$, $p = .01$, $\eta\rho^2 = .05$). Significant differences between drinking conditions were also apparent ($F(2, 112) = 4.90$, $p = .009$, $\eta\rho^2 = .08$). In partial support of hypothesis two, sober individuals were more complete in their recall (*M* = .17, *SD* = .05) than severely intoxicated individuals (*M* = .09, *SD* = .05) ($p = .009$), but moderately intoxicated participants (*M* = .13, *SD* = .06) were no more complete than those who were severely intoxicated ($p > .05$). Sober individuals were also no more complete in their recall than moderately intoxicated participants ($p > .05$).

As previous research (Hildebrand Karlén et al., 2015) suggested that intoxication significantly reduced the recall completeness of female but not male participants, two additional univariate analyses were conducted (with Bonferroni correction). Only 24 male participants took part in this study but there was a fairly even distribution across the three drinking (Sober = 9; Low BAC = 6; High BAC = 9) and two interview (ECI = 13; SI = 11) conditions. For female participants, an effect of drinking condition ($F(2, 92) = 15.39$, $p < .001$, $\eta\rho^2 = .25$) was indicated with sober participants being significantly more complete in their recall than severely intoxicated individuals ($p = .001$). The recall completeness of moderately intoxicated participants, however, was not significantly different from that of sober ($p = .04$) or severely intoxicated individuals ($p = .03$). In contrast to the findings of Hildebrand Karlén et al. (2015), with male participants an effect of drinking condition was also indicated in relation to recall completeness ($F(2, 21) = 6.24$, $p = .007$, $\eta\rho^2 = .37$). Sober individuals were more complete in their recall than moderately intoxicated participants ($p = .006$). The recall completeness of moderately intoxicated individuals, however, was not significantly different from sober ($p = .03$) and severely intoxicated witnesses ($p > .05$). These findings conflict with the conclusions of Hildebrand Karlén et al. as within the present study the recall completeness of both male and female participants was impaired by intoxication.

6.3.5. Type of information.

To test hypothesis four and the predictions of AMT, the memory of participants in the three drinking conditions was investigated in relation to the types of information recalled. Means and standard deviations for type of information recalled (action, object, person and surrounding details) across drinking condition and interview type are shown in Table 6.2, 6.3 and 6.4. To investigate recall performance by information type ANCOVAs were conducted with correct, incorrect and completeness as the dependent variables and interview duration as a covariate. Separate ANOVAs were conducted with confabulations and recall accuracy as the dependent variables. In both instances a reduced α level of 0.01 was employed, applying Bonferroni's correction and significant results were explored by Bonferroni post-hoc tests. Across all five measures of recall, and four types of information no interaction between interview type and drinking condition were highlighted ($p > .05$).

Table 6.2: Means (SDs) for Recalled Information Type Across Interview Type, if Sober

	Surrounding	Object	Action	Person
SI				
Correct	17.50 (7.08)	8.45 (3.83)	13.05 (4.54)	8.00 (3.63)
Incorrect	1.60 (1.64)	2.10 (1.77)	1.05 (1.10)	2.70 (2.41)
Confabulations	0.60 (0.94)	0.50 (0.83)	0.45 (0.69)	0.10 (0.31)
Accuracy	.88 (.10)	.77 (.21)	.89 (.09)	.76 (.17)
Completeness	.12 (.05)	.16 (.07)	.19 (.06)	.20 (.09)
ECI				
Correct	18.85 (7.72)	10.00 (5.10)	16.50 (5.62)	12.45 (5.13)
Incorrect	1.70 (2.15)	2.05 (1.54)	0.45 (0.76)	2.20 (2.26)
Confabulations	0.45 (0.51)	0.20 (0.41)	0.20 (0.52)	0.05 (0.22)
Accuracy	.91 (.07)	.83 (.12)	.96 (.07)	.85 (.12)
Completeness	.13 (.05)	.19 (.10)	.24 (.08)	.31 (.13)

Table 6.3: Means (SDs) for Recalled Information Type Across Interview Type, if Moderately Intoxicated

	Surrounding	Object	Action	Person
SI				
Correct	10.75 (6.84)	5.35 (3.90)	9.65 (5.43)	7.25 (4.24)
Incorrect	0.95 (1.00)	1.80 (1.64)	1.05 (1.23)	1.25 (1.41)
Confabulations	0.40 (0.68)	0.20 (0.52)	0.45 (0.76)	0.05 (0.22)
Accuracy	.85 (.24)	.70 (.25)	.85 (.17)	.84 (.15)
Completeness	.07 (.05)	.10 (.07)	.14 (.08)	.18 (.11)
ECI				
Correct	14.50 (6.65)	8.40 (4.75)	12.95 (6.34)	9.30 (4.77)
Incorrect	0.95 (1.10)	1.45 (1.32)	0.40 (0.60)	1.45 (1.54)
Confabulations	0.10 (.31)	0.10 (0.31)	0.35 (0.75)	0.05 (0.22)
Accuracy	.94 (.06)	.87 (.10)	.95 (.07)	.86 (.12)
Completeness	.10 (.04)	.16 (.09)	.19 (.10)	.23 (.12)

Table 6.4: Means (SDs) for Recalled Information Type Across Interview Type, if Severely Intoxicated

	Surrounding	Object	Action	Person
SI				
Correct	5.89 (4.67)	2.84 (2.41)	6.68 (4.47)	6.85 (3.48)
Incorrect	0.53 (0.96)	1.11 (0.94)	0.79 (0.71)	1.94 (1.78)
Confabulations	0.58 (1.22)	0.26 (0.56)	0.42 (0.61)	0.00 (0.00)
Accuracy	.86 (.18)	.64 (.34)	.77 (.25)	.77 (.21)
Completeness	.04 (.03)	.05 (.05)	.10 (.06)	.17 (.09)
ECI				
Correct	9.80 (5.87)	5.05 (3.66)	8.45 (4.45)	8.30 (4.70)
Incorrect	1.05 (1.19)	1.05 (1.15)	0.50 (0.83)	1.00 (0.92)
Confabulations	0.40 (0.82)	0.20 (0.52)	0.35 (0.59)	0.05 (0.22)
Accuracy	.85 (.11)	.79 (.22)	.90 (.13)	.86 (.14)
Completeness	.07 (.04)	.10 (.07)	.12 (.06)	.21 (.12)

6.3.5.1. Correct recall.

No significant effect of interview type in relation to correct surrounding ($F(1, 112) = 1.74$, $p > .05$, $\eta\rho^2 = .02$), object ($F(1, 112) = 3.58$, $p > .05$, $\eta\rho^2 = .03$), action ($F(1, 112) = 3.68$, $p > .05$, $\eta\rho^2 = .03$) or person information ($F(1, 112) = 5.01$, $p = .03$, $\eta\rho^2 = .04$) was indicated. In line with hypothesis 4, a significant effect of drinking condition was highlighted for the amount of correct surrounding details mentioned ($F(2, 112) = 6.39$, $p = .002$, $\eta\rho^2 = .10$). Sober participants recalled more correct surrounding details ($M = 18.17$, $SD = 7.35$) than those who were severely intoxicated ($M = 7.90$, $SD = 5.61$) ($p = .002$) but not significantly more than those who were moderately intoxicated ($M = 12.63$, $SD = 6.92$) ($p > .05$). No significant difference was indicated between moderately and severely intoxicated participants ($p > .05$). Drinking conditions were also not seen to differ significantly in the amount of correct person ($F(2, 112) = 0.34$, $p > .05$, $\eta\rho^2 = .01$), action ($F(2, 112) = 4.42$, $p = .014$, $\eta\rho^2 = .07$) or object details ($F(2, 112) = 3.02$, $p > .05$, $\eta\rho^2 = .05$) recalled.

6.3.5.2. Incorrect recall.

No significant difference was indicated between interview types in the number of incorrect person ($F(1, 112) = 3.63$, $p > .05$, $\eta\rho^2 = .03$), object ($F(1, 112) = 2.99$, $p > .05$, $\eta\rho^2 = .03$) or

surrounding details ($F(1, 112) = 0.03$, $p > .05$, $\eta\rho^2 < .001$) recalled. Analyses did reveal though that the ECI significantly reduced the number of incorrect action details ($M = 0.45$, $SD = 0.72$) compared with the SI ($M = 0.97$, $SD = 1.03$) ($F(1, 112) = 21.33$, $p < .001$, $\eta\rho^2 = .16$). There was no significant effect of drinking condition for the number of incorrect object ($F(2, 112) = 0.30$, $p > .05$, $\eta\rho^2 = .01$), action ($F(2, 112) = 2.85$, $p > .05$, $\eta\rho^2 = .05$), person ($F(2, 112) = 1.37$, $p > .05$, $\eta\rho^2 = .02$) or surrounding details ($F(2, 112) = 0.23$, $p > .05$, $\eta\rho^2 = .004$) recalled.

6.3.5.3. Confabulations.

No significant effect of interview type was indicated in relation to the amount of confabulated object ($F(1, 113) = 2.35$, $p > .05$, $\eta\rho^2 = .02$), action ($F(1, 113) = 1.36$, $p > .05$, $\eta\rho^2 = .01$), person ($F(1, 113) = 0.00$, $p > .05$, $\eta\rho^2 = .001$) or surrounding details ($F(1, 113) = 2.06$, $p > .05$, $\eta\rho^2 = .02$) reported. There was also no effect of drinking condition on the number of confabulated object ($F(2, 113) = 1. 34$, $p > .05$, $\eta\rho^2 = .02$), action ($F(2, 113) = 0.15$, $p > .05$, $\eta\rho^2 = .003$), person ($F(2, 113) = 0.50$, $p > .05$, $\eta\rho^2 = .01$) or surrounding details ($F(2, 113) = 1.41$, $p > .05$, $\eta\rho^2 = .02$) recalled.

6.3.5.4. Accuracy.

The ECI significantly improved recall accuracy for object (ECI: $M = .83$, $SD = .15$; SI: $M = .70$, $SD = .22$) ($F(1, 113) = 10.28$, $p = .002$, $\eta\rho^2 = .09$) and action details (ECI: $M = .94$, $SD = .10$; SI: $M = .84$, $SD = .18$) ($F(1, 113) = 14.29$, $p < .001$, $\eta\rho^2 = .12$). However, the ECI did not significantly improve recall accuracy for person ($F(1, 113) = 6.75$, $p = .02$, $\eta\rho^2 = .06$) or surrounding details ($F(1, 113) = 1.01$, $p > .05$, $\eta\rho^2 = .01$). Analyses indicated no significant effect of drinking condition on the accuracy of recalled object ($F(2, 113) = 0.83$, $p > .05$, $\eta\rho^2 = .02$), person ($F(2, 113) = 1.02$, $p > .05$, $\eta\rho^2 = .02$), action ($F(2, 113) = 3.88$, $p = .02$, $\eta\rho^2 = .07$) or surrounding details ($F(2, 113) = 2.83$, $p > .05$, $\eta\rho^2 = .05$).

6.3.5.5. Completeness.

In terms of interview type, no significant effect was indicated for surrounding ($F(1, 112) = 1.74$, $p > .05$, $\eta\rho^2 = .02$), object ($F(1, 112) = 3.58$, $p > .05$, $\eta\rho^2 = .03$), action ($F(1, 112) = 3.68$, $p > .05$, $\eta\rho^2 = .03$) or person details ($F(1, 112) = 5.01$, $p = .03$, $\eta\rho^2 = .04$). In partial support of hypothesis four, a significant effect of drinking condition was indicated for the overall completeness of recall for surrounding details ($F(2, 112) = 6.39$, $p = .002$, $\eta\rho^2 = .10$), with sober individuals providing a significantly more complete account ($M = .12$, $SD = .05$) than severely intoxicated participants ($M = .05$, $SD = .04$) ($p = .002$). There was, however, no significant difference in recall completeness between sober and moderately ($M = .08$, $SD = .05$) ($p > .05$) or moderately and severely intoxicated participants ($p > .05$). No significant

effect of drinking condition was indicated for action ($F(2, 112) = 4.42$, $p = .014$, $\eta\rho^2 = .07$), object ($F(2, 112) = 3.02$, $p > .05$, $\eta\rho^2 = .05$) or person details ($F(2, 112) = 0.34$, $p > .05$, $\eta\rho^2 = .01$).

6.3.6. Recall phase.

To further consider where the recall improvement associated with the ECI originated from, the memory performance of participants in the three drinking conditions was investigated across the two interview phases of the SI and ECI (free recall and questioning). Means and standard deviations for each recall phase across drinking condition and interview type are shown in Table 6.5. As each detail was only scored once no assessment of recall completeness was conducted. To investigate memory performance across interview phase, 2 x 3 x 2 ANCOVAs were conducted with correct and incorrect details as the dependent variables and interview duration as the covariate. Separate ANOVAs were conducted with confabulations and recall accuracy as the dependent variables. In both instances a reduced α level of 0.01 was employed, applying Bonferroni's correction and significant results were explored by Bonferroni post-hoc tests. Across all four measures of recall, and two recall phases no interaction between interview type and drinking condition was highlighted ($p > .05$).

6.3.6.1. Correct recall.

Analyses indicated that within the free recall phase, the ECI significantly increased the number of correct details recalled ($M = 27.87$, $SD = 15.38$) compared with the SI ($M = 20.29$, $SD = 10.36$) ($F(1, 112) = 6.47$, $p = .01$, $\eta\rho^2 = .06$), but not in the questioning phase ($F(1, 112) = 1.27$, $p > .05$, $\eta\rho^2 = .01$). No effect of drinking condition was revealed in either the free recall ($F(2, 112) = 2.63$, $p > .05$, $\eta\rho^2 = .05$) or questioning phase of the interview ($F(2, 112) = 2.87$, $p > .05$, $\eta\rho^2 = .05$).

6.3.6.2. Incorrect recall.

No effect of interview type was indicated in the number of incorrect details recalled in either the free recall ($F(1, 112) = 0.95$, $p > .05$, $\eta\rho^2 = .01$) or questioning phase ($F(1, 112) = 1.07$, $p > .05$, $\eta\rho^2 = .01$). Neither was there an effect of drinking condition on incorrect recall in either the free recall ($F(2, 112) = 0.26$, $p > .05$, $\eta\rho^2 = .01$) or questioning phase ($F(2, 112) = 0.47$, $p > .05$, $\eta\rho^2 = .01$).

6.3.6.3. Confabulations.

Analyses revealed no effect of interview type in either the free recall ($F(1, 113) = 1.39$, $p > .05$, $\eta\rho^2 = .01$) or questioning phase ($F(1, 113) = 5.52$, $p = .02$, $\eta\rho^2 = .05$) of the interviews. In

addition, no effect of drinking condition was highlighted in relation to the number of confabulations in either the free recall ($F(2, 113) = 0.80$, $p > .05$, $\eta\rho^2 = .01$) or questioning phase ($F(2, 113) = 1.87$, $p > .05$, $\eta\rho^2 = .03$) of the interviews.

Table 6.5: Means (SDs) for Recall Performance in the Free Recall and Questioning Phases of the Interviews across Drinking and Interview Condition

	Sober	Moderately Intoxicated	Severely Intoxicated	Total
Free Recall Phase				
SI				
Correct	26.60 (6.80)	20.40 (11.44)	13.53 (8.15)	20.29 (10.36)
Incorrect	3.20 (2.21)	2.55 (2.89)	2.16 (1.80)	2.64 (2.35)
Confabulations	0.95 (1.14)	0.80 (1.06)	1.05 (1.13)	.93 (1.10)
Accuracy	.87 (.08)	.84 (.17)	.77 (.19)	.83 (.16)
ECI				
Correct	37.45 (16.38)	27.70 (12.97)	18.40 (10.39)	27.87 (15.38)
Incorrect	2.95 (2.87)	1.95 (1.57)	1.80 (1.79)	2.23 (2.18)
Confabulations	0.75 (1.02)	0.50 (1.00)	0.85 (1.13)	.70 (1.05)
Accuracy	.92 (.06)	.92 (.07)	.86 (.13)	.90 (.09)
Questioning Phase				
SI				
Correct	20.25 (10.77)	12.55 (6.97)	8.74 (6.77)	13.85 (8.17)
Incorrect	4.15 (3.60)	2.50 (1.73)	2.21 (1.69)	2.97 (2.62)
Confabulations	0.70 (1.13)	0.30 (0.57)	0.21 0.54)	.41 (.81)
Accuracy	.80 (0.13)	.79 (.13)	.75 (.26)	.78 (.18)
ECI				
Correct	20.25 (7.81)	17.35 (8.72)	13.10 (8.83)	16.88 (8.45)
Incorrect	3.45 (2.54)	2.30 (2.23)	1.80 (1.15)	2.52 (2.14)
Confabulations	0.15 (0.37)	0.10 (0.31)	0.15 (0.49)	.13 (.39)
Accuracy	.85 (.09)	.90 (.08)	.83 (.13)	.86 (.10)

6.3.6.4. Accuracy.

A main effect of interview type was highlighted in the free recall phase with the ECI significantly increasing recall accuracy (M = .90, SD = .09) compared with the SI (M = .83, SD = .16) ($F(1, 113) = 10.56$, $p = .002$, $\eta\rho^2 = .09$). This improvement in recall accuracy was also apparent between the ECI (M = .86, SD = .10) and the SI (M = .78, SD = .18) in the questioning phase ($F(1, 113) = 8.21$, $p = .01$, $\eta\rho^2 = .07$). No effect of drinking condition was revealed in either the free recall ($F(2, 113) = 4.39$, $p > .05$, $\eta\rho^2 = .07$) or the questioning phase ($F(2, 113) = 1.58$, $p > .05$, $\eta\rho^2 = .03$) of the interview.

6.3.7. Results summary.

In summary, the ECI significantly improved the correct recall of participants irrespective of drinking condition, resulting in a significantly more accurate and complete account. Analyses by information type indicated that the ECI (irrespective of drinking condition) improved recall accuracy predominately for object and action details but also reduced the number of inaccurate actions details reported. Irrespective of interview type, those individuals who were severely intoxicated recalled significantly fewer correct details than sober participants and were consequently less complete in their recall although no less accurate. Moderately intoxicated individuals, however, were no less complete or less accurate than sober participants. Statistical analyses in relation to information type indicated that it was in relation to surrounding details that the correct recall of severely intoxicated individuals was particularly impaired, resulting in them producing a significantly less complete recall of these details. Analyses by interview phase indicated that the ECI's increase in correct recall, and the subsequent improvement in accuracy, was primarily as a consequence of the free recall phase.

6.4. Discussion

This is the first study to look at the ECI as a possible means of improving the recall of intoxicated witnesses. As was initially hypothesised, the ECI was found to improve recall accuracy, with 23-42% more correct details being recalled with this interview technique than the SI. This is in line with previous research (Clifford & George, 1996; Fisher et al., 1989; Geiselman et al., 1984; Köhnken et al., 1994) where the (E)CI has been seen to increase the recall of correct information by approximately 35-40%. Further to the initial prediction, analyses by information type indicated that the improvement in recall from the ECI was derived primarily from an increase in the accuracy of participants' recall of object and action details. It was also hypothesised that in light of similar findings from previous intoxicated forensic recall studies (Flowe et al., 2016; Hagsand et al., 2016; Hildebrand Karlén et al., 2015;

Van Oorsouw & Merckelbach, 2012), and memory regulation research (Koriat et al., 2000), that intoxication would reduce the completeness but not the accuracy of an individual's recall. There was only partial support for this hypothesis. The recall of moderately and severely intoxicated participants was, as predicted, just as accurate as that provided by sober participants. The recall of severely but not moderately intoxicated individuals, though, was significantly less complete than sober participants. Although an interaction between drinking condition and interview type was initially hypothesised, with the ECI particularly improving the recall of severely intoxicated individuals, no such effect was indicated in any of the analyses that were conducted.

Finally, it was hypothesised that, due to the narrowing of attention proposed by AMT and in line with the findings of Schreiber Compo et al. (2011), intoxication would result in fewer correct surrounding details being recalled leading to a particularly less complete recall for these details. Once again there was partial support for this hypothesis. As predicted severely intoxicated participants recalled significantly fewer correct surrounding details and subsequently provided a less complete account of these details than sober individuals. However, in contrast to the predictions of hypothesis four and AMT, compared with sober participants, moderately intoxicated individuals did not recall significantly fewer correct surrounding details; neither were they significantly less complete in their account of the stimuli event.

Ultimately, in terms of the effect of alcohol on witness recall, the findings of this study suggest that with moderate intoxication (M_{BAC} = .05%), at BACs below the drink drive limit for England, Wales and Northern Ireland (.08%), alcohol is not particularly problematic for recall; these individuals were just as accurate and complete in their recollections as sober participants. However, with severe intoxication (M_{BAC} = .14%), at BACs above the drink drive limit for England, Wales and Northern Ireland, alcohol was seen to impair the completeness but not the accuracy of recall. Whilst these findings for severe intoxication are in line with predictions of memory regulation research (Koriat et al., 2000) in that, by providing as accurate an account as possible, fewer details were recalled, this is not the case for more moderate BACs. So why were severely intoxicated participants recalling fewer correct details? As previously indicated, Van Oorsouw and Merckelbach (2012) suggest that the poorer recall of an intoxicated witness may be due to fragmentary blackouts.

The findings of the present study suggest that the 'report everything' and 'mental reinstatement of context' mnemonics of the ECI have the capacity to increase correct recall, and to improve the recall accuracy and completeness of moderately and severely intoxicated individuals. Essentially some of the memories that could be considered 'lost' by the

fragmentary blackouts explanation (White, 2003) were retrieved, potentially due to the additional support provided by the mnemonics of the ECI. The alternative explanation of how alcohol may affect recall, posited in the discussion of study 3, was acute alcohol amnesia (Birnbaum et al., 1978; Jones & Jones, 1980). Through this explanation, with the appropriate cues and prompts 'lost' memories can be to some extent recovered. This effect could explain why the ECI improved recall, as the 'mental reinstatement of context' mnemonic provided the cues and prompts necessary to access the memories that fragmentary blackouts considered 'lost'. Essentially, this supports the suggestion in study 3 that the effect of alcohol concerns the accessibility of memories rather than their availability (Tulving, 1983; Tulving & Pearlstone, 1966), and that the ECI can be used to help witnesses access these memories without negatively affecting the accuracy of what is recalled.

From a criminal justice perspective, this study indicates that severely intoxicated witnesses (those with BACs above the drink drive limit for England, Wales and Northern Ireland) are likely to recall fewer correct details of a witnessed crime, and thereby provide a less complete testimony than a sober witness. Such individuals, however, are likely to be just as accurate in the details they do recall as a sober witness. In contrast, moderately intoxicated witnesses (those with BACs below the drink drive limit for England, Wales and Northern Ireland) are likely to be just as complete and accurate in their recall as a witness who had not consumed alcohol. This study also indicates that, as with sober witnesses, the ECI can be used by police officers to improve the accuracy and completeness of an intoxicated witness' testimony.

Whilst this study suggests that moderate levels of intoxication are not particularly problematic to recall, and that the ECI can assist in improving the recall of intoxicated witnesses, police officers in study 1 indicated that they considered the testimony of an intoxicated witness to be significantly less accurate than that of a sober witness. Further to this, officers indicated that a case was significantly less likely to make it to court if the witness was intoxicated, and that intoxicated witnesses themselves often felt their evidence would not be believed in court. In addition, officers mentioned that they were made to look reckless or incompetent in court if they presented evidence obtained from an intoxicated person, irrespective of the evidential value. It therefore appears that despite there being little research evidence indicating that alcohol has a detrimental effect on eyewitness recall; the court system is predisposed to disregard the testimony of an intoxicated witness. Future research should therefore explore how jurors view the credibility of an intoxicated witness, because jurors, based on the evidence presented, ultimately decide the guilt or innocence of a defendant.

Chapter 7: Study 5: Mock Juror Perceptions of Intoxicated Eyewitness Credibility

Abstract

The purpose of this study was to ascertain if witness intoxication affected mock juror perceptions of witness credibility. To this end jury eligible individuals completed an online questionnaire asking them to rate the confidence, honesty, accuracy, competency, consistency, convincingness, completeness, believability and credibility of a witness, and one of six testimonies provided by participants in study 4. Of these testimonies, an equal proportion were provided by sober, moderately and severely intoxicated witnesses (under or over the drink drive limit for England, Wales and Northern Ireland), and were either short or long in length. Further to this, only half of mock juror participants were made aware of the witness' degree of intoxication. One factor, overall witness credibility, was extracted from a Principal Component Analysis of mock juror ratings of the nine credibility characteristics. This analysis indicated that the knowledge that the witness was intoxicated rather than anything inherent to the testimony caused poorer witness credibility ratings. As there was no main effect of intoxication, however, it appears that jurors are not sensitive to the effects different levels of alcohol can have on recall. The study findings are discussed in relation to their application to the Criminal Justice System and the direction of future research.

7.1. Introduction

Within study 3 it was indicated that severely intoxicated witnesses were likely to have gaps in their memory which, when they are interviewed, may prevent them from providing as complete an account as a moderately intoxicated witness. Further to this, study 4 revealed that the testimony of a moderately intoxicated witness was just as accurate and complete as a sober witness, whilst those who were severely intoxicated were significantly less complete although no less accurate. With studies 3 and 4 indicating that the testimony of an intoxicated witness may not be any less accurate than that provided by a sober witness, it is important to determine how a juror perceives the testimony of an intoxicated individual, as the testimony of an eyewitness is one of the most persuasive pieces of evidence presented to jurors (Boyce et al., 2007; Brewer & Burke, 2002; Lindsay, 1994).

Despite eyewitness memory being prone to errors (Sporer et al., 1995) research indicates that jurors are generally uninformed as to the factors that affect eyewitness accuracy (Lampinen, Neuschatz, & Cling, 2012), and are typically unable to assess the reliability of an eyewitness' evidence (Benton et al., 2006; Loftus, 1986). For example, jurors tend to incorrectly perceive witnesses as more accurate and credible if they are confident (Brewer & Burke, 2002; Schmechel, O'Toole, Easterly, & Loftus, 2006), recall a lot of details (Bell & Loftus, 1988) or their testimony is consistent (Brewer, Potter, Fisher, Bond, & Luszcz, 1999). Research also indicates that when making judgements about the credibility of an eyewitness, the opinion of jurors can be greatly influenced by stereotypes (Mueller-Johnson, Toglia, Sweeney, & Ceci, 2007; Peled, Iarocci, & Connolly, 2004).

Aside from any personal intoxication experiences an individual may have, we have beliefs and established stereotypes about how alcohol will affect us and others (Christiansen & Goldman, 1983; Miller, Smith, & Goldman, 1990). Studies suggest that individuals expect alcohol consumption to have positive and negative consequences, for instance, by enhancing social facilitation (Borjesson & Dunn, 2001), but also by causing cognitive and behavioural impairments, nastiness, and carelessness (Adams & McNeil, 1991). Further to this, research also indicates that while individuals expect alcohol to have positive effects when they are moderately intoxicated, as their intoxication level increases they expect increasingly more negative effects (George & McAfee, 1987; Southwick, Steele, Marlatt, & Lindell, 1981). Research also suggests that individuals expect others to be more susceptible to these effects than they would be themselves, and that an individual's personal drinking habits can further affect how they anticipate alcohol will affect another person (Rohsenow, 1983). For example, compared to drinkers, non-drinkers expect a person to suffer greater cognitive impairment after consuming alcohol (Leigh, 1987; McMahon, Jones, & O' Donnell, 1994; Oei, Ferguson, &

Lee, 1998). As a consequence of these negative stereotypes, jury members may disregard the testimony of a potentially accurate and credible intoxicated witness. For, as indicated in study 4, the testimony of a moderately intoxicated witness may be just as accurate and complete as the testimony of a sober witness.

The effects of negative stereotypes can be seen in studies exploring people's perception of intoxicated sexual assault victims, where intoxicated victims are consistently perceived more negatively than sober victims, and fewer guilty verdicts are reported (e.g., Ferguson & Ireland, 2012; Hammock & Richardson, 1997; Norris & Cubbins, 1992; Stormo, Lang, & Stritzke, 1997). This pattern of viewing an intoxicated victim more negatively is also apparent when it is the police rather than the public making judgements, although this does not affect the likelihood of the perpetrator being charged (Schuller & Stewart, 2000; Stewart & Maddren, 1997). Further to this, as indicated in study 1 of this thesis, many witnesses feel their evidence will not be believed in court if they were intoxicated at the time of the crime. Officers themselves also stated in study 1 that they felt reckless or incompetent in court, if they presented evidence obtained from an intoxicated person, irrespective of the evidential value. Moreover, surveys of potential jurors, law enforcement professionals, and eyewitness experts (Benton et al., 2006; Kassin et al., 2001) indicate that these groups of individuals agree that alcohol intoxication impairs an eyewitness's later ability to recall persons and events. Nevertheless, evidence from this thesis and previous research (Flowe et al., 2016; Hagsand et al., 2013a; Hildebrand Karlén et al., 2015; Van Oorsouw & Merckelbach, 2012) suggests that while intoxication may reduce the completeness of a witness' testimony, the accuracy of that account is not necessarily poorer. It is therefore crucial to ensure that jurors are not disregarding the testimony of a potentially credible witness because of stereotypes that alcohol unilaterally impairs recall. To date though only five studies have employed mock jurors to explore the credibility of intoxicated individuals and have tended to only focus on intoxicated victims.

The findings of this limited body of research suggest that jurors perceive intoxicated sexual assault victims as less credible than sober victims (Schuller & Wall, 1998), and that with higher levels of intoxication a victim's credibility is further reduced (Wall & Schuller, 2000). Yet Wenger and Bornstein (2006) found that only when the victim was illegally intoxicated (consumed alcohol when under the US legal drinking age of 21) were they rated as significantly less credible than a sober victim. Research also indicates that if a witness is confident then a juror's verdict is not affected by the witness' level of intoxication (Lindsay, 1994). At present only one study has looked at juror perceptions of intoxicated witnesses when that individual was a bystander and not the victim (Evans & Schreiber Compo, 2010).

Within this study mock jurors read a summary of a sexual assault or battery case where the defendant was identified by a sober, moderately or extremely intoxicated witness (who was either a bystander or the victim). Mock jurors then answered questions about the potential cognitive impairments of the witness and the credibility of their line-up decision. Intoxicated witnesses were rated as more cognitively impaired than sober witnesses but no such difference was apparent between moderately and extremely intoxicated witnesses. Whilst sober bystanders were perceived as significantly less impaired than sober victims this effect was not apparent between intoxicated victims and bystanders. In addition, the more cognitively impaired the witness was considered to be, then the less credible their identification evidence was deemed to be. Whilst this study explored mock juror ratings of intoxicated witness credibility, these ratings were for line-up decisions and not the witness' full testimony. Consequently, at present, there is a gap in the experimental literature which needs to be explored.

Due to the lack of relevant research, the current study examined mock jurors' perceptions of the credibility of an intoxicated witness' testimony when that individual was a bystander and not the victim of a crime. With studies producing conflicting conclusions as to the extent to which witness and victim intoxication affects both a mock juror's perception of the witness'/victims credibility (Lindsay, 1994; Wall & Schuller, 2000; Wenger & Bornstein, 2006), and also the extent of any cognitive impairment (Evans & Schreiber Compo, 2010), this study manipulated the witness' degree of intoxication between sober, moderately intoxicated and severely intoxicated. To offer a more realistic and forensically relevant assessment of mock jurors' perceptions, free recall transcripts from participants in study 4 of this thesis were selected as the eyewitness testimonies. Additionally, to explore whether any differences between the mock juror participants' ratings of witness credibility (for each of the three intoxication levels) was as a consequence of pre-existing biases or stereotypes, half of the mock jurors rated each witness' credibility in the absence of knowledge of the witness' degree of intoxication. To investigate whether juror perceptions of credibility were a function of the witness' testimony length and number of details recalled, each of the three intoxication levels also included both a short and long testimony. Finally, mock jurors were asked about their personal drinking habits to determine if individual differences affected their credibility ratings.

In light of previous research (Evans & Schreiber Compo, 2010; Schuller & Wall, 1998; Wall & Schuller, 2000) it was hypothesised that the testimony of an intoxicated witness would be rated as less credible than that of a sober witness. However, due to conflicting results (Evans & Schreiber Compo, 2010; Wall & Schuller, 2000) no predictions were made as

to the differences in credibility ratings between moderately and severely intoxicated witnesses. Secondly it was hypothesised that, due to potentially pre-existing stereotypes (Leigh, 1987; Rohsenow, 1983), when mock jurors were aware of the witness intoxication level, their testimony would be rated as less credible than when jurors were not provided with this knowledge. Thirdly it was hypothesised that, in accordance with juror perceptions of sober witnesses (Bell & Loftus, 1988); mock jurors would rate long testimonies, which included more details, as more credible than short testimonies. Due to a lack of previous research no predictions were made as to any interactions between intoxication level, testimony length and juror knowledge of witness intoxication.

7.2. Method

7.2.1. Participants.

A total of 240 jury eligible individuals (92.9% female) completed the online study which ensured that there were 20 participants in each condition. This figure meant that each testimony was viewed 40 times which is not dissimilar to previous juror perception research. Within these past studies sample sizes have been employed which have meant that each testimony was rated as few as 13 times (Culhane & Hosch, 2004; Henry, Ridley, Perry, & Crane, 2011; Stobbs & Kebbell, 2003). Potential mock jurors were invited to take part via social media (e.g., Twitter and Facebook) using a snowballing technique starting with friends and family. This opportunity sample ranged in age from 18 to 67 years (M = 35.64, SD = 11.86) with all mock juror participants being eligible for jury service in the United Kingdom. As a consequence, this study has greater external validity than previous research with mock juries, where undergraduate students tend to take part (Evans & Schreiber Compo, 2010; Wall & Schuller, 2000; Wenger & Bornstein, 2006).

A univariate analysis indicated no significant difference in the ages of the mock juror participants across the twelve conditions ($F(11, 228) = 0.63$, $p > .05$, $\eta\rho^2 = .03$). In terms of mock juror participant gender, log-linear analyses indicated no interaction between gender and knowledge of witness' intoxication level ($X^2(1) = 1.61$, $p > .05$), gender and testimony length ($X^2(1) = 0.06$, $p > .05$) or gender and intoxication level ($X^2(2) = 0.50$, $p > .05$). The mock juror participants were predominately White British (97.1%) and employed (84.2%). The remaining mock juror participants indicated that their ethnicities were White Irish (0.4%), other White background (0.8%), Asian Indian (0.8%), Mixed White and Black Caribbean (0.4%) and any other ethnic group (0.4%). Regarding employment status, the remaining mock juror participants indicated they were unemployed (1.7%), a homemaker (6.7%), a student (4.6%), retired (2.5%) or preferred not to answer (0.4%).

7.2.2. Design.

The study utilized a 3 (Witness intoxication level: Sober, moderately intoxicated, severely intoxicated) x 2 (Knowledge of witness' intoxication level: With knowledge, without knowledge) x 2 (Testimony length: Long, short) independent design. Each witness transcript was rated 40 times overall with 50% of mock jurors who viewed each testimony being aware of the witness' degree of intoxication. Dependent measures were obtained as to the perceived credibility of each witness' testimony in relation to believability, consistency and convincingness, credibility, confidence, honesty, competence, and how good a witness the jurors perceived them to be overall. The perceived accuracy and completeness of each testimony was also assessed. Responses were measured on a 7 point Likert scale (1= *not at all* to 7 = *extremely*) with lower scores indicating, for example, a less credible or believable testimony. Mock juror participants' agreement with three statements about their own drinking habits (1 = *completely disagree* to 7 = *completely agree*) were also included, as were two questions about how frequently they consumed alcohol.

7.2.3. Materials.

The mock juror participants each read one of the six free recall witness transcripts provided by participants within study 4 and completed a questionnaire asking about the credibility of the witness and their testimony. Permission was obtained from the study 4 witnesses to include their testimonies within this present study. To protect the anonymity of all study 4 witnesses, all personal and identifying details such as the participants name were removed from all testimonies.

7.2.3.1. Testimonies.

Of these six testimonies (appendix L); two were provided by witnesses who were sober, two were from witnesses who were moderately intoxicated (under the drink drive limit for England, Wales and Northern Ireland; 0.29mg/L and 0.33mg/L) and a further two were from severely intoxicated witnesses (over the drink drive limit for England, Wales and Northern Ireland; 0.54mg/L and 0.63mg/L). Within each pairing one testimony was short in length and the other long. Short testimonies were 497 words (sober), 445 words (moderately intoxicated) or 462 words (severely intoxicated) in length and included 33, 31 and 33 details respectively. Long testimonies were 835 words (sober), 797 words (moderately intoxicated) or 761 words (severely intoxicated) in length with 67, 64 and 61 details respectively. All six testimonies were from participants who were interviewed with the ECI in study 4 and were aged between 18 and 21 years old.

No significant differences were indicated between the cognitive abilities of participants who provided the sober, moderately or severely intoxicated witness testimonies, and the remainder of the study 4 participants in the respective drinking conditions. In regards to the number of words recalled in the effortful processing task, a one sample t-test indicated that, for both the short and long sober testimonies used in the present study, the number of words participants recalled was not significantly different from the number of words recalled by the sober condition in study 4 (Short: $t(39) = 0.20$, $p > .05$; Long: $t(39) = 1.78$, $p > .05$). This lack of a significant difference was also apparent between the moderately (Short: $t(39) = 1.51$, $p > .05$; Long: $t(39) = 0.50$, $p > .05$) and severely intoxicated (Short: $t(38) = 0.37$, $p > .05$; Long: $t(38) = 0.37$, $p > .05$) witness testimonies selected for study 5, and the number of words recalled by the respective intoxication conditions in study 4.

7.2.3.2. Juror questionnaire.

Based on the work of Evans and Schreiber Compo (2010) and Henry et al. (2011), a questionnaire was constructed to investigate both the mock juror participants' perceptions of the testimony of intoxicated witnesses and their own beliefs about drinking alcohol. A copy of the full questionnaire can be seen in appendix M; including an example of a witness testimony (sober, short and with knowledge). The questionnaire was split into nine sections. In section one each mock juror participant was given information about the study and asked to read an information/consent form, and create a Unique Reference Number (URN) through which their responses could be identified and deleted should they wish to withdraw. Section two provided potential mock juror participants with the eligibility criteria to be a juror within the UK. If the mock juror participants met this criterion they were directed to section three of the questionnaire where they were asked to provide demographic information such as age, gender, ethnicity and employment status. Section four provided the mock juror participants with a brief summary of the case followed by one of the six witness transcripts. Within this summary half the mock juror participants in each of the intoxication level and testimony length conditions were told the witness' intoxication level (sober, moderately intoxicated or severely intoxicated); the remaining mock juror participants were not provided with this knowledge.

Section five addressed questions of the credibility of the witness whose testimony the mock juror participants had just read, asking them to rate the honesty, competence, confidence, convincingness, accuracy, completeness, consistency, believability and credibility of the witness' testimony. Within this section mock juror participants were also asked how the credibility of the witness could have been improved. The sixth section asked the mock juror participants about the ability of the witness to recall the crime, and then how likely it

was that the witness would correctly recall the event if they were sober, moderately or severely intoxicated at the time of the crime. Section seven asked the mock juror participants about their degree of agreement with statements about drinking alcohol, for example "drinking more than one or two drinks in one evening is irresponsible". In section eight the mock jurors were asked about their own personal drinking habits, for example "how often do you drink alcohol?" In the final section mock juror participants were asked whether they had been a victim of a theft, or been a juror within the last year. This section also included a manipulation check question to confirm that the mock juror participants correctly recalled the information provided about the witness's degree of intoxication. The questionnaire used a mixture of multiple-choice, scaled and open-ended questions.

7.2.4. Procedure.

Potential mock juror participants were directed to a web page on the Unipark academic survey software website where they were first provided with an information sheet and consent form. After consenting to continue, mock juror participants were asked to create a URN. Potential mock juror participants were then presented with the UK juror eligibility criteria which they would need to meet in order to participate. All jury eligible participants were then asked to provide details of their age, gender, ethnicity and employment status. After these demographic questions, mock juror participants were randomly allocated, by the computer program, to one of the 12 experimental conditions and asked to read the appropriate witness testimony. This was followed by the questionnaire itself and then the debrief form (appendix M).

7.3. Results

The initial information sheet of the questionnaire was viewed 4961 times, with 476 individuals proceeding to create a URN. A total of 425 participants provided their demographic information with 240 participants completing the questionnaire and responding to all the questions. It is from this sample of 240 participants that the analyses are reported.

7.3.1. Participant characteristics.

To confirm that the manipulation, in regards to witness intoxication, had been successful all mock juror participants in the 'with knowledge' condition were asked to indicate the witness' degree of intoxication. All 120 of these 'with knowledge' mock juror participants responded correctly thereby confirming that the manipulation was indeed successful. Information was also collated on the number of units of alcohol consumed and drinking frequency of mock

juror participants. As seen in Tables 7.1 and 7.2, a similar pattern of drinking frequency and units consumed were reported by mock juror participants viewing the sober, moderate and severely intoxicated testimonies. This was supported by a chi-squared analysis of the data in Table 7.1 where no significant interaction between units consumed and intoxication condition (X^2 (10, N = 240) = 12.12, p > .05) was indicated.

Table 7.1: Mock Juror Participant Responses: Units of Alcohol Consumed (Count and Percentages) by Intoxication Level

	Sober		Moderately Intoxicated		Severely Intoxicated	
Units	N	%	N	%	N	%
0	4	5	4	5	2	2.5
1 – 2	26	32.5	21	26.3	32	40
3 – 4	23	28..8	14	17.5	16	20
5 – 6	13	16.3	25	31.3	19	23.8
7 – 8	5	6.3	7	8.8	7	8.8
9+	9	11.3	9	11.3	4	5

In regards to the drinking frequency of mock juror participants shown in Table 7.2, no significant interaction between drinking frequency and intoxication condition was indicated (X^2 (8, N = 240) = 4.36, p > .05). However, within this analysis, 20% of cells had an expected frequency of less than five. Whilst Cochran (1954) recommends avoiding the use of chi-square when more than 20% of cells have an expected frequency of less than five, a Fisher's exact test confirmed this lack of significant relationship between drinking frequency and intoxication condition (p > .05).

Table 7.2: Mock Juror Participant Responses: Drinking Frequency (Count and Percentages) by Intoxication Level

	Sober		Moderately Intoxicated		Severely Intoxicated	
	N	%	N	%	N	%
Never	11	13.8	10	12.5	8	10
Once a month or less	23	28.8	26	32.5	28	35
2-4 times a month	32	40	32	40	28	35
2-3 times a week	9	11.3	11	13.8	12	15
4 or more times a week	5	6.3	1	6.3	4	5

Mock juror participants were also asked whether they had been a juror or the victim of a theft within the past year. The majority of the mock juror participants (99.17%) indicated that they had not been a juror. The two mock juror participants who had been jurors were both in the moderately intoxicated condition. Regarding being the victim of a theft, 92.5% of mock juror participants stated that they had not been a victim within the last year and 2.1% indicated that they did not know. In addition, a total of 5.4% of mock juror participants revealed they had been a victim of a theft within the last year. These 13 mock juror participants were distributed relatively equally across the three intoxication, two testimony length and two knowledge conditions.

7.3.2. Credibility characteristics.

Initial explorations of the data indicated no significant outliers but did reveal that all nine of the credibility characteristics (confidence, honesty, accuracy, competency, consistency, convincingness, completeness, believability and credibility) were moderately to strongly correlated (r = .42 to .77). To preserve power and to prevent issues of multicollinearity a Principal Component Analysis (PCA) was conducted to reduce the number of rating variables. The Kaiser-Meyer-Olkin measure indicated the sampling adequacy of the PCA analysis (KMO = .92). This figure, according to Field (2009) is 'superb', and indicates that the patterns of correlations are relatively similar, so PCA should produce distinct and reliable factors. Bartlett's test of sphericity (χ^2 (36) = 1574.76, p < .001) confirmed that the correlations between the items were large enough for PCA, and scatterplots indicated the linearity of the variables (Field, 2009). An initial analysis was conducted to obtain eigenvalues for each of the nine credibility characteristics. Only one component had an eigenvalue over Kaiser's criterion of one, and this explained 65.17% of the variance. The scree plot also clearly showed an inflection that justified retaining only one component. A reliability analysis on this one factor, which appears to reflect overall credibility, indicated that it had high internal reliability (α = .93), with the factor loadings seen in Table 7.3.

Table 7.3: Means (SDs) and Factor Loadings for Principal Component Analysis on Credibility Characteristics

Scale	Factor Loadings	Mean (SD)
Confidence	.74	3.43 (1.34)
Honesty	.75	4.65 (1.48)
Accuracy	.85	3.63 (1.36)
Competency	.79	3.72 (1.38)
Consistency	.77	4.18 (1.62)
Convincingness	.86	3.78 (1.36)
Completeness	.77	3.49 (1.46)
Believability	.85	4.04 (1.49)
Credibility	.87	3.68 (1.46)

Using the one factor of overall credibility that was extracted from the PCA as a dependent variable, a 3 (Intoxication level: sober, moderately intoxicated or severely intoxicated) x 2 (Knowledge: with or without) x 2 (Testimony length: short or long) independent ANOVA was conducted. Overall credibility was established by adding together a participant's response to each of the nine credibility questions (Field, 2009). As seen in Table 7.4 a main effect of testimony length was indicated with long testimonies (M = 36.08, SD = 10.73) being rated as more credible than short testimonies (M = 33.12, SD = 9.94) ($F(1, 228) = 5.08$, $p = .03$, $\eta p^2 = .02$). A main effect of knowledge was also apparent with mock juror participants rating the witness' testimony as more credible if they were unaware of the witness' intoxication level (M = 36.05, SD = 10.64) compared with when they were provided with this knowledge (M = 33.15, SD = 10.04) ($F(1, 228) = 4.85$, $p = .03$, $\eta p^2 = .02$). No effect of intoxication was revealed ($F(2, 228) = 2.25$, $p > .05$, $\eta p^2 = .02$). Post-hoc tests did not reveal any significant two-way interactions between knowledge and intoxication level ($F(2, 228) = 0.58$, $p > .05$, $\eta p^2 = .01$), knowledge and testimony length ($F(1, 228) = 0.37$, $p > .05$, $\eta p^2 = .002$) or intoxication level and testimony length ($F(2, 228) = 0.72$, $p > .05$, $\eta p^2 = .01$). Further to this no three-way interaction between knowledge, intoxication level and testimony length ($F(2, 228) = 2.24$, $p > .05$, $\eta p^2 = .02$) was indicated.

Table 7.4: Means (SDs) for Mock Juror Participant Ratings of Overall Eyewitness Credibility (Out of 63)

Knowledge	Testimony Length	Sober	Moderately Intoxicated	Severely Intoxicated	Total
With	Short	30.65 (8.26)	34.40 (9.10)	28.75 (8.84)	31.27 (8.91)
	Long	37.25 (12.13)	34.55 (9.34)	33.30 (10.94)	35.03 (10.81)
	Total	33.95 (10.78)	34.48 (9.11)	31.03 (10.08)	33.15 (10.04)
Without	Short	33.35 (8.33)	35.25 (11.13)	36.30 (12.34)	34.97 (10.62)
	Long	36.35 (11.11)	41.40 (8.43)	33.65 (11.14)	37.13 (10.63)
	Total	34.85 (9.81	38.33 (10.23)	34.98 (11.68)	36.05 (10.64)
Total	Short	32.00 (8.30)	34.83 (10.05)	32.53 (11.27)	33.12 (9.94)
	Long	36.80 (11.49)	37.98 (9.44)	33.48 (10.90)	36.08 (10.73)
	Total	34.40 (10.25)	36.40 (9.82)	33.00 (11.02)	34.60 (10.43)

7.3.3. How good was the witness overall?

Means and standard deviations for mock juror participant ratings for the final question of section five, how good the individual was as a witness overall (1 = *Not at all credible* to 7 = *Very credible*), across knowledge condition, intoxication level and testimony length are shown in Table 7.5. An initial look at the data suggested that long testimonies were viewed as more credible by mock juror participants and that when they were informed as to the intoxication level of the witness the testimony was deemed less credible. In addition, whilst severely intoxicated witnesses were rated as the least credible, it was moderately intoxicated rather than sober witnesses who were seen to be the most credible. A univariate ANOVA on ratings of how good a witness the individual was overall indicated that mock juror participants rated witnesses with long testimonies (M = 3.95, SD = 1.43) as significantly better than those with short testimonies (M = 3.34, SD = 1.36) ($F(1, 228) = 11.79$, $p = .001$, $\eta p^2 = .05$). When jurors were aware of whether the witness was sober or intoxicated prior to the crime, these testimonies (M = 3.42, SD = 1.38) were viewed as significantly poorer than when this information was withheld (M = 3.87, SD = 1.44) ($F(1, 228) = 6.69$, $p = .01$, $\eta p^2 = .03$). However, no main effect of intoxication level was revealed ($F(2, 228) = 2.50$, $p = .08$, $\eta p^2 = .02$). No interactions between knowledge and intoxication level ($F(2, 228) = 0.99$, $p > .05$, $\eta p^2 = .01$), knowledge and testimony length ($F(1, 228) = 0.80$, $p > .05$, $\eta p^2 = .003$), intoxication level and testimony length ($F(2, 228) = 0.27$, $p > .05$, $\eta p^2 = .002$), or intoxication level, knowledge and

testimony length ($F(2, 228) = 1.31$, $p > .05$, $\eta p^2 = .01$) were apparent. This pattern is the same as that found in section 7.3.2. (Credibility characteristics).

Table 7.5: Means (SDs) for Mock Juror Participant Ratings of How Good a Witness the Individual was Overall Across Knowledge Condition, Intoxication Level and Testimony Length

Knowledge	Testimony Length	Sober	Moderately Intoxicated	Severely Intoxicated	Total
With	Short	3.25 (1.21)	3.30 (1.13)	2.55 (1.15)	3.03 (1.19)
	Long	3.80 (1.44)	3.80 (1.58)	3.80 (1.44)	3.80 (1.46)
	Total	3.52 (1.34)	3.55 (1.38)	3.18 (1.43)	3.42 (1.38)
Without	Short	3.50 (1.57)	3.85 (1.35)	3.60 (1.47)	3.65 (1.45)
	Long	3.80 (1.44)	4.70 (1.03)	3.80 (1.54)	4.10 (1.40)
	Total	3.65 (1.49)	4.27 (1.26)	3.70 (1.49)	3.87 (1.44)
Total	Short	3.38 (1.39)	3.57 (1.26)	3.08 (1.40)	3.34 (1.36)
	Long	3.80 (1.42)	4.25 (1.39)	3.80 (1.47)	3.95 (1.43)
	Total	3.59 (1.41)	3.91 (1.36)	3.44 (1.47)	3.65 (1.42)

7.3.4. Improving eyewitness credibility.

Mock juror participants were also asked how they thought the witness' credibility might have been improved. Only 66 of the 240 mock juror participants (27.5%) choose to respond to this free recall question with an approximately equal number of respondents from each intoxication level (sober: 19, moderate: 24, severe: 23) and a near equal split between the with and without knowledge conditions (with: 34; without: 32). Irrespective of intoxication level and knowledge condition the most common suggestion, given by 22.08% of the 66 mock juror participants who responded, was for the witness to stop saying "I think" as often because it indicated uncertainty and a lack of confidence. Other frequently mentioned suggestions included providing more details of the crime (14.29%), providing context of how they happened to witness the crime (14.29%) and also ensuring the testimony was consistent from beginning to end (11.69%).

When mock juror participants were unaware of the witness's intoxication level, eliminating "I think" from the testimony remained the most commonly mentioned suggestion to improve witness credibility for both sober (28.57%) and moderately intoxicated (45.45%)

witnesses. However, for severely intoxicated witnesses providing a statement that was consistent (25%) was the most commonly stated means of improving credibility. However, when mock juror participants were aware of the witnesses' intoxication level the removal of "I think" from the witness's statement was the primary suggestion for improving the credibility of moderately intoxicated witness' (35.29%). For sober witnesses, 53.85% of mock juror participants indicated that including more crime details would improve credibility. In terms of improving the credibility of severely intoxicated witnesses 30.77% of mock juror participants stated "not being drunk" would improve credibility, compared to 11.76% of mock juror participants providing this suggestion for moderately intoxicated witnesses.

7.3.5. Ability to remember details of the crime.

On a scale of 1 (*extremely poor*) to 7 (*excellent*) mock juror participants were asked about the witness' ability to remember details of the crime. A univariate analysis indicated a main effect of testimony length with long testimonies (M = 3.87, SD = 1.55) being associated with better recall of crime details than short testimonies (M = 2.99, SD = 1.27) ($F(1, 228) = 23.59$, $p < .001$, $\eta p^2 = .09$). A main effect of knowledge was also apparent. Mock juror participants who had no knowledge of whether the witness was sober or intoxicated prior to the crime gave higher ratings (M = 3.62, SD = 1.47) for the witnesses' ability to recall details of the crime, than those who knew whether the witness was sober or intoxicated (M = 3.25, SD = 1.49) ($F(1, 228) = 4.07$, $p = .045$, $\eta p^2 = .02$). No main effect of intoxication level was highlighted ($F(2, 228) = 1.63$, $p > .05$, $\eta p^2 = .01$), neither were significant interactions found between intoxication level and knowledge ($F(2, 228) = 1.70$, $p > .05$, $\eta p^2 = .02$), intoxication level and testimony length ($F(2, 228) = 0.19$, $p > .05$, $\eta p^2 = .002$), knowledge and testimony length ($F(1, 228) = 0.68$, $p > .05$, $\eta p^2 = .003$) or intoxication level, knowledge and testimony length ($F(2, 228) = 1.06$, $p > .05$, $\eta p^2 = .01$).

7.3.6. Sober, moderately intoxicated and severely intoxicated recall.

On being asked how likely it was that the witness would correctly recall the event if they were sober, moderately or severely intoxicated during the crime, mock juror participants indicated that they believed sober witnesses were the most likely to correctly recall the crime (M = 4.98, SD = 1.35). This was followed by moderately intoxicated witnesses (M = 3.51, SD = 1.21), and severely intoxicated witnesses were considered to be the least likely to recall the event (M = 1.76, SD = 1.17). A one-way dependent ANOVA indicated a significant difference between these groups ($F(1.47, 350.80) = 686.49$, $p < .001$, $\eta p^2 = .74$) with all post-hoc analyses being significant ($p < .001$).

7.3.7. Beliefs about drinking.

To understand mock juror participant's beliefs about drinking and how this may influence their ratings of witness credibility, mock juror participants were asked to rate their agreement with statements about drinking beliefs and behaviours, on a scale of 1 (*completely disagree*) to 7 (*completely agree*). Initial analyses indicated a significant positive correlation between mock juror participants' agreement ratings in relation to the statement 'drinking more than one or two drinks in one evening is irresponsible' (statement one), and 'I make bad decisions when I drink' (statement three) ($r = .24$, $p < .001$). Significant relationships, however, were not indicated between statement one and two (I always make sure there is a designated driver when I go out) ($r = .05$, $p > .05$), or statement two and three ($r = .05$, $p > .05$). Further to this, as seen in Table 7.6, mock juror participant agreement ratings for the three drinking belief statements were not found to correlate with the overall measure of witness credibility established in the Principal Component Analysis.

Table 7.6: Correlation Matrix Across Beliefs About Drinking Scales and Credibility Ratings

	I always make sure there is a designated driver when I go out	I make bad decisions when I drink	Credibility scale
Drinking more than 1 or 2 drinks in 1 evening is irresponsible	.05	.24 **	-.05
I always make sure there is a designated driver when I go out		.05	-.04
I make bad decisions when I drink			-.10

**$p < .001$

As seen in Table 7.7 a negative correlation was indicated between statement one and mock juror participant ratings of how likely it was that the witness would correctly recall the event if they were sober ($r = -.17$, $p < .01$). This relationship was also apparent between statement one and mock juror participant ratings of the likelihood of correct recall from a moderately intoxicated witness ($r = -.19$, $p < .01$). However, the relationship between statement one and how likely a severely intoxicated witness was to correctly recall the event was not significant ($r = -.12$, $p > .05$). Additional analyses indicated a near significant relationship between statement two and mock juror participant ratings of how likely it was

that a moderately intoxicated witness would correctly recall the crime (r = - .12, p = .056). Mock juror participant ratings of how likely it was that a moderately intoxicated witness would correctly recall the crime were also revealed to be significantly associated with agreement with statement three (r = -.17, p = .01). Overall these correlations suggest that the more strongly a mock juror participant agrees with the idea that drinking is irresponsible and that they make bad decisions when they drink, then they are less likely to think a moderately intoxicated witness will correctly recall the crime. Ultimately, a mock juror participant's belief about drinking affects how they perceive the recall of moderately, but not severely, intoxicated witnesses.

Table 7.7: Correlation Matrix Across Beliefs about Drinking and Likelihood of Correct Recall

	Likelihood of correct recall when		
	Sober	Moderately Intoxicated	Severely Intoxicated
Drinking more than 1 or 2 drinks in 1 evening is irresponsible	-.17*	-.19*	-.12
I always make sure there is a designated driver when I go out	-.08	-.12	-.10
I make bad decisions when I drink	-.10	-.17*	-.05

*p < .01

7.3.8. Summary of results.

Using an overall measure of credibility, as established from the Principal Component Analysis, long testimonies were considered more credible by mock juror participants. When they were aware of the intoxication level of the witness, then mock juror participants viewed the testimony as less credible than when this information was withheld. No effect of intoxication was apparent. This same pattern was also indicated when mock juror participants were asked how good the witness was overall. Mock juror participants also indicated that they believed if a witness was moderately or severely intoxicated then they would be significantly less likely to correctly recall the event than if they were sober. Finally, mock juror participant's beliefs about drinking also affected how they perceived the correct recall of moderately but not severely intoxicated witnesses.

7.4. Discussion

The present study aimed to examine mock juror participants' perceptions of the credibility of an intoxicated witness' testimony when that individual was a bystander and not the victim of a crime. Unlike previous research, this study sought to explore mock juror participants' perceptions of intoxicated witnesses, rather than victims, with a non-violent crime and employing mock juror participants from a non-academic population. In addition, this study aimed to look at the witness' overall testimony credibility rather than just the credibility of their line-up decision.

It was initially hypothesised that the testimony of an intoxicated witness would be rated as less credible than a testimony provided by a sober witness. The results of this study, however, do not support this hypothesis. A main effect of intoxication level was not apparent in relation to the overall credibility of the witness or when mock juror participants were asked to rate how good a witness the individual was overall. In terms of credibility, the lack of effect of intoxication is in line with the conclusions of Wenger and Bornstein (2006), where only illegal intoxication (alcohol consumed when under the US legal drinking age of 21) was seen to reduce victim credibility. Yet these current findings conflict with the work of Schuller and Wall (1998), and Wall and Schuller (2000) where intoxicated victims were considered less credible as their level of intoxication increased. The different roles of the witness (bystander and victim) and the different crime types (theft and sexual assault) may account for the discrepancy between the current study and previous studies and should be investigated in future research.

There is another possibility for the inconsistent findings. In each of the previous studies (Evans & Schreiber Compo, 2010; Schuller & Wall, 1998; Wall & Schuller, 2000; Wenger & Bornstein, 2006) the researchers presented all their mock juror participants with the same testimony, with only the independent variables (i.e., intoxication level) being manipulated. Additionally, in each of these studies there was no 'without knowledge' condition. Consequently, the mock juror participants were assessing the credibility of the witness based solely upon the knowledge that they were sober or intoxicated. However, within the present research, at each intoxication level different testimonies were employed. As a result, mock juror participants were also assessing witness credibility in relation to the testimony itself. Subsequently, whilst previous research suggests only that the mere knowledge that a witness is intoxicated can affect a mock juror participant's perception of the witness' credibility; the current study also indicates that the actual content of the testimony of an intoxicated witness does not directly affect the witness' credibility.

This explanation clearly has implications for court cases where the credibility of an intoxicated witness is important, as it suggests that knowing that a witness has consumed alcohol, rather than their recall itself, reduces their credibility. There is further evidence of this within the present study. When mock juror participants were asked directly how likely it was that a witness would correctly recall the event (if they were sober, moderately or severely intoxicated), mock juror participants indicated that higher intoxication levels would leave an individual less likely to correctly remember details of the crime. This supports Evans and Schreiber Compo's (2010) findings where jurors rated intoxicated witnesses as more cognitively impaired than sober witnesses. Unlike the present study though, Evans and Schreiber Compo found no such difference between moderately and extremely intoxicated witnesses. However, within the present study when mock juror participants were asked about the witness' ability to remember details of the crime, there was no significant difference in mock juror participant ratings across the three witness intoxication conditions. This further indicates that the actual testimony of moderately and severely intoxicated witnesses was not seen to be any poorer than that of a sober witness. This will be discussed further in relation to hypothesis two.

Hypothesis two predicted that, due to pre-existing stereotypes (Leigh, 1987; Rohsenow, 1983), mock juror participants who were aware that the witness was intoxicated would rate the testimony as less credible, compared to jurors who were unaware that the witness was intoxicated. There is some support for this hypothesis with jurors providing witnesses with lower overall credibility ratings when they knew the witness' intoxication level. As such, intoxicated witnesses were viewed as less credible and generally considered a poorer witness overall merely because the mock juror participant knew that the witness had consumed alcohol. As a consequence, it appears that when considering the credibility of a witness, jurors take into account the expectation that intoxication will impair an individual's cognitive capabilities (Adams & McNeil, 1991) and view the witness more negatively. Interestingly this reinforces the suggestion, made in relation to hypothesis one, that it is the mere knowledge that a witness is intoxicated, not the testimony itself, that affects a mock juror participant's perception of their credibility.

Finally, it was hypothesised that, in accordance with juror perceptions of sober witnesses, mock juror participants would rate long testimonies, which included more details, as more credible than short accounts (Bell & Loftus, 1988, 1989). There was support for this hypothesis with witnesses who provided longer and more detailed testimonies being viewed as significantly more credible and generally a better witness. Further to this, mock juror participants also associated long testimonies with an individual who was better able to

remember details of the crime. Subsequently, in the present study a better memory of the crime was seen to translate to a more credible witness. This is in accordance with the findings of Bell and Loftus (1988) where participants perceived a witness as more credible precisely because they recalled more details. The results of the current research, however, conflict with the findings of Fisher, Mello, and McCauley (1999) where longer testimony length and extra details associated with recall via the Cognitive Interview were not seen to increase witness credibility. Further to this Westera, McKimmie, Kebbell, Milne, and Masser (2015) found that although the number of questions asked was a significant predictor of complainant credibility; response length and overall testimony length were not. As indicated by Westera et al. methodological differences between the studies may account for the inconsistencies in the research findings. Westera et al. attributed the discrepancies between their results and those of Bell and Loftus (1988) to a jurors' heightened sensitivity to details in the latter study due to the researchers use of shorter testimonies (700 - 800 words) compared to Westera et al.'s (2015) longer testimonies (1009 - 2018 words). This heightened sensitivity would also explain the discrepancy between the findings of the present study and those of Westera et al. as the current study employed testimonies that varied in length from 445 to 835 words.

In light of these findings, the present study indicates that if a mock juror participant knows a witness was intoxicated at the time of the crime then they will view their testimony as significantly less credible and generally consider them a poorer witness overall, although the testimony itself is not considered any less credible than that of a sober witness. In terms of improving the credibility of intoxicated witnesses, mock juror participants within this study indicated that eliminating 'I think' and providing a more consistent testimony (for severely intoxicated witnesses) would be beneficial. Without further research, though, the effect of these 'improvements' is currently unknown but does warrant further study.

Whilst this research provides a valuable first step in understanding how jurors perceive the testimony of witnesses at varying levels of intoxication, there are a number of areas where improvements could be made. First, there are significant differences between the methodology of this online research and a genuine court case which requires caution to be taken when generalising the findings beyond the laboratory. Research does indicate, however, that the findings from online studies tend to be similar to those produced with participants in a laboratory (e.g., McGraw, Tew, & Williams, 2000; O'Neil & Penrod, 2001). Studies looking at mock juror participant perceptions of eyewitness credibility have typically employed a paradigm with non-deliberating jurors rather than a mock jury (Bornstein, 1999). The ecological validity of the current study, however, could have been improved by

reconstructing the key aspects of a court case if the budget allowed, or by presenting witnesses with the videoed testimony of the witness, rather than a written version of their recall. Through either option the mock juror participants would then have been able to observe the behaviours, mannerisms and demeanour of the witness, as in a real court case, and which research indicates may affect a witness' credibility, at least when sober (Burnett & Badzinski, 2005; McKimmie, Masser, & Bongiorno, 2014). A more in-depth study of the key aspects of a court case would also allow investigations to be made as to the decision-making processes of jurors when they are discussing how much reliance they can place on the testimony of an intoxicated witness. This is particularly important considering that this study suggests that a mock juror participant's personal beliefs about drinking can affect how likely they think it is that the witness will correctly recall the crime, at least with moderately intoxicated witnesses. Previous research though does indicate that a jurors' pre-deliberation and post-deliberation verdicts often match, thereby suggesting that juror discussions may have little influence over their verdict (Devine, Clayton, Dunford, Seying, & Pryce, 2001; Kalven & Zeisel, 1966; Stasser, Kerr, & Bray, 1982; Zeisel & Diamond, 1978).

Second, although the participant demographics in the present study reflect greater external validity than previous research; a large proportion of participants were white (97.1%), employed (84.2%) and female (92.5%). Consequently, a higher percentage of male jury eligible participants, and a wider range of ethnicities, would help ensure a more representative sample than the current study. Previous research indicates that males and females differ in their expectations as to how alcohol will affect the opposite sex (Borjesson & Dunn, 2001). Coupled with the fact that this present study suggests that a mock juror participant's personal drinking beliefs can impact how likely they think an intoxicated witness is to correctly recall the crime, it is important to ensure that the participant sample is representative of a genuine jury.

Third, in the current study, to help ensure participant retention, each mock juror participant only read the testimony of one witness. As such, within-participant variations in the ratings of witness credibility could not be explored. However, as the current study indicates that poorer credibility ratings for intoxicated witnesses were not due to fundamental differences between the testimonies, the fact that this study was not able to compare how a single mock juror participant viewed the six testimonies is a clear limitation.

Fourth, the purpose of this study was to focus on jurors' perceptions of the overall credibility of an intoxicated witness, subsequently unlike previous research (Evans & Schreiber Compo, 2010; Schuller & Wall, 1998; Wall & Schuller, 2000; Wenger & Bornstein, 2006) the study did not look at how juror assessments of witness credibility affected their

verdict. As this is the primary purpose of a court case, to determine the guilt or innocence of the defendant, establishing how jurors' perceptions of witness intoxication affect their verdicts should be examined.

This is the first study to look at mock juror participant's perceptions of the overall credibility of an intoxicated witness. Future research should therefore initially seek to replicate the current study to confirm the validity of the conclusions drawn here, whilst taking into account the limitations that have been identified. It would also be beneficial for legal professionals if this study was replicated with a range of different crimes and with victims and bystanders as witnesses. If the findings of this study are supported, and further research indicates that fundamental differences in the testimonies of witnesses are not the cause of mock juror participants' poorer credibility ratings for intoxicated witnesses; then including a measure of a jurors own pre-existing stereotypes would be advantageous. With the inclusion of such a measure it may be possible to further understand the extent to which a person's beliefs affect their perceptions of an intoxicated witness. Additionally, a means of improving a juror's perception of the credibility of an intoxicated witness would be beneficial, and may also alleviate some of the intoxicated witness concerns that they will not be believed, as indicated in study 1. The present study suggests that reducing how often an intoxicated individual says 'I think' may help achieve this aim and for severely intoxicated individuals improving the consistency of their testimony could also be helpful. These improvements are especially important if the findings of studies 2a, 2b and 3 are confirmed, in that, although their testimony may be less complete, the recall accuracy of intoxicated witnesses is no poorer than that of a sober witness.

From a criminal justice perspective, this study suggests that when jurors are made aware that a witness has consumed alcohol then they perceive that individual to be less credible, although this is not due to any particular elements inherent to the testimony of intoxicated witnesses. Further to this, jurors do not view the testimony of a severely intoxicated witness to be any less complete, accurate or consistent than that provided by a moderately intoxicated individual. This indicates that although mock juror participants are perceptive of the negative impact intoxication may have on an individual; they are not as sensitive to the effects of different levels of intoxication.

Chapter 8: General Discussion

8.1. Introduction

At the beginning of this thesis it was stated that despite alcohol being a factor in around half of the violent crimes committed in England and Wales, intoxicated eyewitness recall was still an under-investigated area, with only two UK studies having been published to date. With so little research there are currently no specific guidelines for police officers, lawyers, the Crown Prosecution Service (CPS) and jurors, which detail the capabilities or impairments of intoxicated witnesses. Consequently, it was considered important that this research begin to understand the recall abilities of these individuals. It was also felt that this understanding would be improved through the testing of the theory currently underpinning alcohol and eyewitness research: Alcohol Myopia Theory (Steele & Josephs, 1990). This theory considers the range of cues an intoxicated individual can perceive in a situation is restricted, due to a disproportionate degree of attention being given to highly salient cues; weaker, less salient cues subsequently receive less attention. Within this thesis, in contrast to previous eyewitness research, information salience was determined by spatial location and also semantic meaning, rather than just centrality. To achieve this, a series of three studies were conducted. Additional studies assessed the extent of the problem with intoxicated witnesses, the effectiveness of the ECI to aid in the recall of intoxicated witnesses and finally juror perceptions of the credibility of intoxicated witnesses. These six studies are summarised below before the theoretical and practical implications of the findings are discussed. This is followed by recommendations for the Criminal Justice System (i.e., police officers, CPS, lawyers and jurors) as to the recall abilities of intoxicated witnesses.

8.2. Summary of Results

The first study was a preliminary investigation to establish the extent of the problem with intoxicated witnesses within England, and to determine if the research reported in this thesis was indeed necessary. To this end, police officers from seven constabularies in England completed an online questionnaire about their interactions with intoxicated witnesses. Consistent with North American research, officers indicated intoxicated witnesses were a common occurrence with their BACs reported as being around one and a half times the drink drive limit for England, Wales and Northern Ireland. These witnesses were considered to typically be Caucasian, aged between 20 and 24, and witness to a range of crimes. Whilst respondents indicated that they may ascertain key details from the witness whilst they are intoxicated, the formal court testimony was taken later when the witness was sober. Further

to this, officers felt that intoxicated witnesses were less accurate and their cases were less likely to make it to court than if they were sober. Finally, officers also mentioned intoxicated witnesses felt their evidence would often not be believed in court. This first study therefore suggested that intoxicated witnesses are a widespread issue within England that warrants further investigation. A series of studies were therefore conducted which sought to examine the recall of intoxicated witnesses, and to determine whether AMT could explain the pattern of any indicated impairment. A summary of these study findings can be seen in Table 8.1.

Table 8.1: Summary of the Independent Variables in Each Study and the Main Findings

Study	Between-Subjects Variables	Mean BACs	Within-Subject Variables	Recall Method	Salience	Drinking Condition	Interview Type	Interaction
2a Lab Study	Drinking condition	Placebo = .00% Non-Alcohol = .00% Alcohol = .06%	Salience (high/low)	Recognition test	Main effect – High salience recall more correct	No main effect	N/A	No interaction
				Written free recall – Completeness	Main effect – High salience recall more complete	No main effect – completeness	N/A	No interaction
				Written free recall – Accuracy	N/A	No main effect – accuracy	N/A	N/A
2b Lab Study	Drinking condition	Placebo = .00% Non-Alcohol = .00% Low BAC = .06% High BAC = .09%	Salience (high/low)	Recognition test	Main effect – High salience recall more correct	No main effect	N/A	No interaction
				Written free recall – Completeness	Main effect – High salience recall more complete	No main effect – completeness	N/A	No interaction
				Written free recall – Accuracy	N/A	No main effect - accuracy	N/A	N/A

Table 8.1: (cont.)

Study	Between-Subjects Variables	Mean BACs	Within-Subject Variables	Recall Method	Salience	Drinking Condition	Interview Type	Interaction
3 Field Study	Drinking Condition	Low = .05% High = .14%	Salience (high/low)	Recognition test	Main effect – High salience recall more accurate	No main effect	N/A	No interaction
				Verbal free recall – Complete-ness	Main effect – High salience recall more complete	Main effect – High BAC less complete	N/A	High BACs & low salience less complete. Greatest deficit for high salience
				Verbal free recall – Accuracy	N/A	No main effect – accuracy	N/A	N/A
4 Field Study	Drinking condition & interview type (ECI/SI)	Sober = .00% Moderate = .05% Severe = .14%	Information type (Surrounding/ Object/ action/ person	Verbal free recall – Complete-ness	Surrounding details - Severe intoxication less complete than sober	Main effect – Sober more complete than severe intoxication	Main effect – ECI more complete recall	No interaction
				Verbal free recall – Accuracy	No effect of drinking condition on any information type	No main effect – accuracy	Main effect – ECI more accurate recall	No interaction

Studies 2a and 2b sought to directly assess the basic tenets of AMT; that the range of cues an intoxicated individual perceives is restricted due to a disproportionate amount of attention being given to immediate salient cues. Subsequently, weaker less salient cues receive less attention. A week after watching a complex and forensically relevant videoed stimuli event in the laboratory, the high and low salience recall of sober (control or placebo) and intoxicated witnesses (M_{BAC} = .06%; M_{BAC} = .09%) were compared using written free recall and a true/false recognition test. Contrary to the predictions of AMT, although participants were less accurate in their recall of low salience details on the recognition test, no effect of drinking condition or interaction between the variables was apparent. This pattern of effects was also evident in the completeness of free recall. In addition, there was no significant difference in the free recall accuracy of sober, placebo and intoxicated participants.

The lack of an effect of drinking condition or interaction with information salience in studies 2a and 2b was unexpected given the predictions of AMT. One suggested reason for these non-significant effects was that the BACs safely attainable in the laboratory were insufficient to impair high and low salience recall. Study 3 therefore replicated studies 2a and 2b, but with a higher real-world level of intoxication and increased forensic relevancy. During a night out in the SU bar participants watched the stimuli event used in studies 2a and 2b but with BACs either below (Low: M_{BAC} = .05%), or at and above (High: M_{BAC} = .14%) the drink drive limit for England, Wales and Northern Ireland. A week later, in a separate location, the true/false recognition test and a verbal free recall task were attempted. In line with studies 2a and 2b, a main effect of salience was revealed with participants being more accurate in relation to high salience information, irrespective of intoxication level. Contrary to the expectations of AMT, but in accordance with the findings of study 2a and 2b, intoxication was not seen to affect the accuracy of an individual's recall on the recognition test. Further to this, no interaction was revealed between intoxication level and information salience.

Consequently, alcohol did not have the particularly detrimental effect on low salience recall that was predicted by AMT. When 'don't know' responses on the recognition test were taken into consideration, though, high BACs were seen to have the weaker memory. In regards to free recall completeness, an interaction between information salience and BAC was revealed. The fewest number of details were reported in relation to low salience information (irrespective of drinking condition). In addition, high BACs (irrespective of information salience) provided a significantly less complete account of the event, compared with low BACs. Nevertheless, contrary to the propositions of AMT, alcohol was seen to have a particularly detrimental effect on the recall of high rather than low salience information. Finally, in line with studies 2a, 2b and also previous research (Hagsand et al., 2013a, 2016;

Hildebrand Karlén et al., 2015; La Rooy et al., 2013; Schreiber Compo et al., 2012; Van Oorsouw & Merckelbach, 2012), there was no significant effect of BAC on free recall accuracy.

The results from study 3 therefore suggest that higher, real-world levels of intoxication have a detrimental effect on free recall although not with the pattern suggested by AMT. A number of potential explanations are considered for these disparate conclusions, including the possibility that participants in studies 2a and 2b may have engaged in spontaneous context reinstatement, to aid their recall. To test this possibility, study 4 sought to explore whether the ECI could be used to improve intoxicated witness recall compared with the SI. As with study 3, in the SU bar while on a night out, sober, moderately (M_{BAC} = .05%) and severely (M_{BAC} = .14%) intoxicated participants watched the stimuli event. A week later in the laboratory, participants were interviewed using the ECI or SI. As hypothesised, the ECI improved recall accuracy and completeness across all three drinking conditions, but contrary to expectations severely intoxicated participants did not derive any greater benefit from the ECI than moderately intoxicated or sober participants. Irrespective of interview method, severely intoxicated witnesses were less complete, although no less accurate, in their recall than sober participants. This was primarily due to impaired recall for surrounding details, as per AMT (if an item 'type' definition of salience was applied). Moderately intoxicated participants though were no less accurate or complete than sober participants. Ultimately, this study suggests that moderate levels of intoxication are not particularly problematic to recall, whilst severe intoxication negatively affects recall completeness but not accuracy. Finally, as with sober witnesses, the study suggests that the ECI can be used by police officers to improve the accuracy and completeness of an intoxicated witness' testimony.

Studies 2a, 2b, 3 and 4 suggested that moderate intoxication levels were not particularly detrimental to recall. Officers in study 1 indicated that intoxicated witnesses often felt their testimony would be doubted in court. Study 5 therefore sought to investigate mock juror perceptions of intoxicated witness credibility. Each participant, as a mock juror, viewed one of six testimonies provided by either a sober, moderately or severely intoxicated 'witness' from study 4. These testimonies were either short or long in length, with only half of mock juror participants being told the extent of the witness' intoxication. Within this 3 x 2 x 2 independent design study, mock juror participants rated witnesses across nine scales of credibility. Contrary to expectations, mock juror participants did not rate the actual testimony of moderately and severely intoxicated individuals as less credible than that provided by sober witnesses. When mock juror participants were aware that the witness was intoxicated,

however, the testimony was deemed significantly less credible. Additionally, long testimonies were also viewed as more credible, but there was no interaction between the three variables. This study, therefore, suggests that if a juror knows a witness was intoxicated at the time of the crime then they will view the witness as significantly less credible. Further to this the witness will be generally considered a poorer witness overall, although the testimony itself is not considered any less credible than that of a sober witness.

8.3. Theoretical and Practical Implications

Within this thesis a number of findings were obtained which have potential theoretical implications for our understanding of alcohol's effect on recall, and the application of Alcohol Myopia Theory to eyewitness research. Further to this, the evidence also suggests that there may be an alternative, and perhaps more appropriate, means of explaining the effect of alcohol on eyewitness recall for complex and forensically relevant information.

8.3.1. Alcohol Myopia Theory.

To test the validity of applying AMT to eyewitness recall, the current thesis employed a definition of information salience that was arguably (see section 1.4.5. Alcohol Myopia Theory) more consistent with, and encompassing of, the basic tenets of AMT than previous research (Flowe et al., 2016; Harvey et al., 2013a, 2013b; Schreiber Compo et al., 2011; Van Oorsouw & Merckelbach, 2012). Whilst this thesis' definition of salience incorporated both semantic meaning and spatial location, the recall pattern predicted by AMT was not apparent even when mean BACs were raised to .14% (studies 2a, 2b, and 3). Despite the lack of support for the theory that is currently underpinning alcohol and eyewitness research, this thesis' examination of AMT has revealed four key findings. These are in relation to blood alcohol concentration, information salience, the influence of contextual cues, and recall method. Each of these factors is of potential theoretical and practical interest.

8.3.1.1. Blood alcohol concentrations.

Contrary to the predictions of AMT, this thesis found that with mean BACs ranging from .06% to .09% (studies 2a and 2b) alcohol did not cause an overall memory deficit. This was apparent when recall was assessed through either a true/false recognition test or free recall. This finding is consistent with the conclusions drawn by previous researchers where mean BACs as high as .08% were found not to impair overall recall completeness when compared with a sober or placebo witness (La Rooy et al., 2013; Schreiber Compo et al., 2011, 2012). As seen previously (Table 1.4), BACs ranging from .04 - .06% (40-60 mg/100ml) are associated

with impaired vision and hearing, whilst BACs from .07 - .09% (70 - 90 mg/100ml) are associated with slowed reactions, impaired judgement and self-control issues. This thesis, though, indicates that at around these BACs, impairments to the memory of an eyewitness may not be apparent. Consequently, from a practical perspective this finding suggests that BACs up to around the drink drive limit for England, Wales and Northern Ireland are not particularly detrimental to an eyewitness' recall (this conclusion will be discussed further in section 8.3.2. (Fragmentary Blackouts or Acute Alcohol Amnesia)). Additionally, from a theoretical perspective, this thesis suggests that AMT's narrowing of attention does not account for the recall impairments of intoxicated eyewitnesses with mean BACs up to .09%. This is due to the fact that their overall memory deficits were not significantly poorer than those of sober witnesses for high or low salience information.

At higher mean BACs (M_{BAC} = .14%) study 3 suggests that as with previous research (Van Oorsouw & Merckelbach, 2012), alcohol impairs overall free recall, but that high rather than low salience details are significantly more susceptible to alcohol impairment. However, in study 4, at similar mean BACs, severely intoxicated witnesses were seen to be significantly less complete in their recall of surrounding details than sober witnesses. It is therefore possible that the significant detrimental effect alcohol had on high salience details in study 3, was precisely because of the definition of salience that was adopted. In study 3, salience was determined by semantic meaning and spatial location, whereas within study 4, an information 'type' definition of salience was applied. As previously indicated, this change in salience definition was due to the fact that not all details within the stimuli event could be consistently classified as spatially *and* semantically of high or low salience (as per studies 2a, 2b and 3). Further to this, semantic meaning was only determined for the statements on the recognition test and not every detail seen within the stimuli event. Notably, in neither study was the witness' free recall accuracy or recognition test response accuracy affected by intoxication. These findings will be discussed further in section 8.3.1.2. (Information salience) and 8.3.3. (Accuracy and completeness). Ultimately it appears that real-world levels of intoxication (and non-laboratory based studies) are needed in order to study AMT further.

8.3.1.2. Information salience.

Within study 3, mean BACs above the drink drive limit for England, Wales and Northern Ireland resulted in 15% fewer high salience details being correctly recalled versus only a 4% reduction in low salience recall. This significantly greater alcohol-based recall deficit in relation to high rather than low salience information is the reverse of the pattern of recall impairments predicted by AMT. A closer examination of the data, though, revealed that

participants' recall completeness was particularly poor in relation to low salience information (*M* = .04, *SD* = .05), with some intoxicated individuals failing to recall any of these details. One possible explanation, for the pattern of recall deficits apparent in study 3, is that the definition of salience in this thesis, albeit more encompassing of the basic tenets of AMT, may have been so strict that low salience information was more akin to 'no salience'. Within studies 2a, 2b and 3, salience was defined by both spatial location and semantic meaning. It may therefore be that the low salience aspects of the recall tasks were just so difficult to encode, that even sober witnesses were poor at recognising or recalling the low salience information. This can be seen in the low salience completion rates across all drinking conditions in studies 2a, 2b and 3 (Study 2a: *M* = .03; Study 2b: *M* = .03; Study 3: *M* = .04). As a result, intoxicated participants did not have a chance to impair low salience recall as few low salience details were encoded to begin with. Consequently, the influence of floor effects, in relation to low salience information, may have contributed to the pattern of recall evident in study 3.

In study 3, intoxication was seen to have a particularly detrimental effect on the recall of high salience details when salience was determined by both semantic meaning and spatial location. In contrast, within study 4, where an item 'type' definition of salience was applied, severe intoxication was seen to impair recall completeness for surrounding details to the greatest extent. This therefore suggests that how salience is defined affects whether the myopic behaviour of AMT is revealed. Previous alcohol and forensic recall studies (Read et al., 1992; Van Oorsouw & Merckelbach, 2012) though, which achieved similar BACs and analysed the information that was recalled, have found results comparable to those produced within study 3. In agreement with the findings of this thesis, both Read et al. (1992; M_{BAC} = .11%) and Van Oorsouw and Merckelbach (2012; M_{BAC} = .17%), using a free recall task and perpetrator recall, concluded that severe intoxication impairs high salience recall (person details) to a greater extent than low salience recall (environmental details). From a theoretical perspective, as indicated by Van Oorsouw and Merckelbach, it is difficult to reconcile these findings with the alcohol induced narrowing of attention proposed by AMT. In light of this, potential alternative explanations which can account for this thesis' findings will be suggested and discussed in section 8.3.2. (Fragmentary Blackouts or Acute Alcohol Amnesia).

8.3.1.3. The influence of contextual cues.

According to AMT whether there is a cognitive or recall difference between sober and intoxicated individuals depends on the specific situation and the internal/external cues that become most noticeable to the individual at the time (Steele & Josephs, 1990). This thesis,

though, suggests that such cues need not be restricted to the stimuli event, and that the recall environment may also be of significance. At mean BACs of .05% and .14%, study 4 indicated that the 'mental reinstatement of context' elements of the ECI have the capacity to improve the recall of intoxicated witnesses. It is therefore possible that within studies 2a and 2b, where encoding and recall occurred in the same location, participants engaged in spontaneous context reinstatement to overcome any alcohol-based recall deficits. A closer examination of the recall completeness data in studies 2b and 3, with mean BACs of .06% and .05% respectively, provided some support for this assertion.

In study 2b (where spontaneous context reinstatement was possible) participants recalled 47% of high salience details correctly compared with 39% in study 3 (where encoding and recall occurred in separate locations). However, in study 4 there was no interaction between intoxication level and interview technique. Consequently, within studies 2a and 2b, sober participants were likely to have derived the same degree of benefit from spontaneous context reinstatement as the intoxicated participants. As there was no sober condition included in study 3 though it is not possible to confirm if this is the case. Ultimately from a theoretical perspective this finding suggests that external cues, such as the environment, can affect the overall amount of information an individual's recalls. This has clear practical implications, for both researchers and those in the CJS. With not only the physical environment, but also the interview method (with or without mental reinstatement of context) potentially affecting what details an eyewitness reports this needs to be considered by future researchers so as to avoid confounding their results. For the CJS, techniques such as the ECI may prove to be an extremely useful tool in obtaining as much reliable information as possible from an intoxicated witness, without impairing recall accuracy.

8.3.1.4. Recall method: True/false recognition test vs. free recall.

Within studies 2a, 2b and 3 the memory of participants was assessed through a free recall and a true/false recognition test. Across all three studies no effect of intoxication was apparent in relation to the recognition test. This is in line with the findings of previous alcohol and general memory research, where intoxication is seen to regularly impair the free recall of word lists whilst the impairment of recognition memory is less consistent (Curran & Hildebrandt, 1999; Duka et al., 2001; Hashtroudi et al., 1984). In the only other forensically relevant study that has employed a true/false recognition test, Harvey et al. (2013b) also found recognition recall was not significantly affected by intoxication (M_{BAC} = .12%). Yet, as in this thesis, when Harvey et al. (2013a; M_{BAC} = .06%) assessed memory through a free recall task intoxicated participants recalled fewer correct details. From a practical and theoretical

perspective, it therefore appears that the recall method is an important factor in whether intoxication is seen to impair overall recall. At higher levels of intoxication, when alcohol is seen to produce recall deficits, it is only free recall and not recognition memory that is impaired. The recognition test, though, measures recall accuracy for specific details, whilst free recall can be used to determine recall completeness as well as accuracy.

Throughout this thesis intoxication has not been seen to significantly impair the accuracy of a witness' recall, whether that is through a recognition test or free recall. This, therefore suggests that the effect recall method has upon what an intoxicated individual reports, may actually be the consequence of alcohol impairing recall completeness but not accuracy. The 'don't know' response analysis in study 3 may provide some insight into this. When 'don't know' responses on the recognition test were taken into consideration, high BAC participants (M_{BAC} = .14%) gave fewer correct and more 'don't know' responses than low BAC participants (M_{BAC} = .05%), thereby indicating high BACs had a more sketchy memory of the stimuli event. A closer examination of the true/false response statistics in studies 2a, 2b, and 3, as well as those of Harvey et al. (2013b), indicated that in all four studies sober and intoxicated participants gave a correct response 62-66% of the time. On the other hand, free recall response accuracy in studies 2a, 2b, and 3 ranged from 94-96% for sober and intoxicated participants (M_{BAC} = .05 -.09%). It therefore appears that without a lack of complete freedom in what they choose to report a participant's recall accuracy is reduced. This is consistent with the findings of research with sober individuals where recall formats such as open ended accounts produce higher accuracy rates than cued or forced choice recall tasks (Fisher, Brewer, & Mitchell, 2009).

Further to this, the 'don't know' response analysis of recognition test responses in study 3 indicated an effect of intoxication. It therefore appears that participants had issues determining a threshold at which to balance accuracy and completeness, or be selective in what information they report (not what they recall). This will be discussed further in section 8.3.3. (Accuracy and completeness). From a theoretical perspective, it appears that the method of recall, recognition or free recall, can affect whether an overall alcohol-based recall deficit becomes evident. From a practical perspective, and to enhance forensic relevancy, though, free recall should ideally be the focus of research attention, especially as this is the closest to what happens in a forensic interview. This is especially important if, as it appears in this thesis, that alcohol affects the completeness but not the accuracy of an intoxicated individuals recall.

In light of the findings of this thesis it appears that many of the discrepancies between previous studies and the mixed support that AMT has received are due to the

complex nature of the theory. As repeated throughout this thesis, AMT predicts that whether or not there is a difference in the recall of sober and intoxicated individuals depends on the specific situation and the internal/external cues that become most noticeable, to the individual, at the time. Consequently, conflicting study findings are likely driven not only by the different types of stimuli, intoxication level, recall method, memory measurements, encoding and retrieval contexts, but also the thresholds at which researchers deem a detail to be of high or low salience. This wide range of potential factors or cues may each play a role in what a witness will ultimately recall, either independently or in combination with each other. Ultimately, it is difficult to see how AMT's focus on the distinction between high and low salience details can, in the real-world, predict which details of a specific crime a witness is likely to have poorer recall for.

8.3.1.5. A new theory of alcohol and eyewitness memory.

With studies 2a, 2b and 3 indicating that alcohols detrimental effect on recall does not follow the pattern predicted by AMT, it may prove more productive to look at an approach based on theories of long-term memory. As discussed in section 1.3 (Alcohol and Memory Research), contemporary theories of memory consider that there are two distinct thought processing paths which are available when completing a cognitive task. Whilst pathway one is quick and automatic, pathway two is slow, effortful and controlled. Within this thesis when recall was assessed through a recognition test no effect of intoxication was apparent. As the recognition test itself provided details of the event, the participant did not have to engage in the controlled processing necessary to generate a list of potential details to recall. In contrast, for the free recall task, severe intoxication impaired recall completeness but not accuracy. With this task participants had to firstly engage in controlled processing to generate a mental account of the crime, and then determine which details to recall in their testimony. As with general alcohol memory research (Hasher & Chromiak, 1977; Tracy & Bates, 1999) it, therefore, appears that for eyewitness recall, alcohol is impairing the second slow and controlled pathway of long-term memory. However, alcohols effect on this controlled processing pathway of long term memory, is not simply unilaterally impairing recall.

Any new approach to explaining alcohols effect on the effortful pathway of memory retrieval, therefore, needs to consider the findings of this thesis. First, this controlled processing pathway appears to be only negatively affected by BACs that are above the drink drive limit. Further to this, because the correct recall of an intoxicated individual can be increased if the contextual cues at encoding are also present at retrieval, a new model would need to consider this interplay between the controlled processing of recall and the automatic

processing of the contextual cues. From the findings of this thesis it appears that perhaps the fast processing associated with the encoding of contextual cues is supporting or aiding the more controlled processing of free recall. Ultimately for intoxicated witness there seems to be an interaction between automatic and controlled processing.

8.3.2. Fragmentary Blackouts or Acute Alcohol Amnesia.

Study 3 of this thesis, and the findings of Read et al. (1992) and Van Oorsouw and Merckelbach (2012) indicate that at around double the drink drive limit for England, Wales and Northern Ireland (M_{BAC} = .11 - .17%), it is the recall of high rather than low salience information that is particularly impaired. As previously indicated, Van Oorsouw and Merckelbach explain this pattern of findings through fragmentary blackouts. This thesis, however, suggests an alternative, and arguably more appropriate means of explaining alcohols effect on recall: Acute alcohol amnesia. Like fragmentary blackouts, acute alcohol amnesia is a form of anterograde amnesia; the effects of intoxication, though, are more subtle.

At high blood alcohol concentrations, whilst an intoxicated individual may perceive and encode an event, fragmentary blackouts consider there may be some failure in the process of consolidating the memory, such that the event or detail is forgotten (White, 2003). An individual would only become aware of those gaps in their memory when they are informed there are details they do not remember, although they still cannot recall them first-hand (Goodwin, 1977). Study 4 of this thesis, though, indicates that an intoxicated witness' loss of memory is not fatal. That with the 'report everything' and 'mental reinstatement of context' mnemonics of the ECI the correct recall, accuracy and completeness of intoxicated witnesses can be improved. Although this finding conflicts with a fragmentary blackout explanation of alcohols effect on recall, it is consistent with acute alcohol amnesia. Through this latter theory, with appropriate cues and prompts, the memories that fragmentary blackouts consider forgotten can to some extent be retrieved (Birnbaum et al., 1978; Hashtroudi & Parker, 1986; Jones & Jones, 1980). Ultimately the ECIs ability to improve the recall of intoxicated witnesses favours an explanation of acute alcohol amnesia over fragmentary blackouts.

Research does indicate, however, that fragmentary blackouts are not an uncommon occurrence especially within the student population, with studies suggesting that around half of students have experienced at least one alcohol-induced blackout (Buelow & Koeppel, 1995; White, Jamieson-Drake, & Swartzwelder, 2002). It is therefore possible that the student participants in study 3 and 4 did experience a fragmentary blackout. However, acute alcohol amnesia is a more common side effect of intoxication in both alcoholics and social drinkers

than blackouts (see Parker et al., 1980). Fragmentary blackouts typically require BACs of at least .15% (Kalant, 1996; White, 2003), with research also suggesting that BACs of even higher at .25 - .30% (Julien & DiCecco, 2010) are necessary. Only one study has found gaps in memory from fragmentary blackouts with lower BACs (M_{BAC} = .06%; Wetherill & Froome, 2011). Fragmentary blackouts therefore tend to require high levels of intoxication. The highest mean BAC achieved within this thesis was .14% (study 3: *SD* = 0.04; and study 4: *SD* = 0.03), which is below the intoxication levels at which research indicates fragmentary blackouts occur. Rather than the high mean BACs associated with fragmentary blackouts, the detrimental effects of acute alcohol amnesia have been consistently found to affect recall at lower BACs of .08% and above (e.g., Birnbaum et al., 1978; Carpenter & Ross, 1965; Hashtroudi & Parker, 1986; Hashtroudi et al., 1983; Jones & Jones, 1980). This is clearly more in line with the BACs achieved throughout this thesis, suggesting that participants who forgot details were more likely to have experienced amnesia than a blackout.

From a theoretical perspective, this research suggests that acute alcohol amnesia may be a better explanation for alcohols detrimental effect on recall than either fragmentary blackouts or AMT. This is primarily due to the lower BACs at which acute alcohol amnesia exhibits deficits and also the fact that the ECI aided recall for memories that the fragmentary blackouts explanation considered 'lost'. Further to this, the ECI's capacity to improve intoxicated witness recall also suggests that alcohols effect on recall pertains to impairing the accessibility of memories rather than their availability. It appears that whilst some of the memories of an intoxicated individual may be consolidated (i.e., available), without cues and prompts they may not be recalled (i.e., not accessible). From a practical perspective, this would mean that a witness may remember more details than they can immediately recall through a standard or structured police interview. Therefore, the CJS should encourage the use of the ECI with intoxicated witnesses wherever possible.

8.3.3. Accuracy and completeness.

Within this thesis, mean BACs of .14% were seen to have a detrimental effect on free recall completeness. Accuracy though was unimpaired irrespective of whether memory was assessed via free recall or a recognition test. As stated in section 8.3.1.1. (Blood alcohol concentrations), it therefore appears that alcohol affects the accuracy and completeness of an eyewitness' testimony to different degrees. The latter seems to be more susceptible to the negative effects of intoxication. Research suggests, however, that when an eyewitness has complete freedom over what they report, then, they may be strategic in what information they provide (Evans & Fisher, 2011; Koriat & Goldsmith, 1996a; Koriat, et al., 2000; Luna, Higham, & Martin-Luengo, 2011; Weber & Brewer, 2008). Although they may seek to be both

accurate and complete, when an individual is uncertain of the information they recall, then the two aims of accuracy and completeness (informativeness) may compete (Koriat & Goldsmith, 1996b; Yaniv & Foster, 1995). Within such a situation, when deciding how to balance accuracy and completeness within their recall, a witness, or any individual, is directed by their goals within that particular context (Koriat & Goldsmith, 1996a).

To this end, a witness has two main options when providing their account to the police. The witness may refrain from providing a detail in their testimony if they believe that the likelihood of that detail being correct is less than some accuracy threshold that they have set themselves (Koriat & Goldsmith, 1996b). Alternatively, they may adjust the level of detail (the grain size) of what they report in their testimony (Ackerman & Goldsmith, 2008; Goldsmith, Koriat, & Weinberg-Eliezer, 2002; Yaniv & Foster, 1997). A fine-grained testimony may be more informative (complete) but is likely to be less accurate. In contrast a coarse-grained testimony although less informative may well be more accurate (Goldsmith et al., 2002; Yaniv & Foster, 1997). Essentially as grain size increases, the probability that what is reported is accurate also increases; the informativeness or the completeness of that report, however, decreases. Consequently, a coarse-grained testimony would provide a witness with the most likely chance of being accurate (Yaniv & Foster, 1997). Such a testimony, however, is likely to be so vague that it would be of little use to those in the CJS and, with sober individuals at least, there is a general aversion to providing such a coarse-grained response (Ackerman & Goldsmith, 2008). When balancing completeness and accuracy, sober individuals tend to favour informativeness (completeness) over accuracy. Further to this, judges are also inclined to favour inaccurate fine-grained responses over accurate coarse grained accounts (at least within a certain degree of error) (Yaniv & Foster, 1997).

Contrary to sober witnesses this thesis suggests that intoxicated witnesses tend to favour providing an accurate but less complete testimony. A possible reason for this is that having known they have consumed alcohol the participants may expect to suffer significant recall deficits. Consequently, they may be setting themselves higher thresholds as to how confident they have to feel about a detail before they report it. Their testimony is therefore less complete but no less accurate. Participants in this thesis, though, were not asked how confident they were with regards to the details they recalled in their free recall. As a result, it is not possible to determine whether they were deliberately withholding information due to a lack of confidence, or if they did not actually recall the details. With the ECI increasing the recall accuracy and completeness of intoxicated witnesses, however, it would appear that these individuals may well know more accurate information than they are reporting. Further to this Curran (2006) indicated that when individuals are able to direct their own recall (i.e.,

free recall) an intoxicated individual may well be as accurate as a sober witness. This is assumed to be due to the fact that these individuals recall details they found interesting and processed deeply (Craik, 1977). However, they hold back reporting those details they only vaguely remember or have forgotten, and are subsequently less complete in their recall than a sober witness, but no less accurate. This is in line with the findings of this thesis, but from a practical perspective, as already indicated, this trade-off direction is the opposite of that preferred by judges, who favour completeness or informativeness, over accuracy (Yaniv & Foster, 1995).

8.3.4. Eyewitness credibility.

Previous research studying mock jurors' perceptions of intoxicated witnesses has indicated that the more impaired a witness is rated to be, then the less credible their identification of the suspect (Evans & Schreiber Compo, 2010). This negative effect of intoxication on credibility was also evident in study 5 where jurors viewed moderately and severely intoxicated witnesses as less credible. Notably, this poorer credibility rating was only apparent if the juror knew that the witness had consumed alcohol. Without this knowledge the witness' testimony was not seen as significantly less credible than that of a sober witness. Consequently, it is the knowledge that the witness was intoxicated rather than anything inherent to the testimony itself that was the cause of the poorer credibility rating. As there was no main effect of intoxication on witness credibility it appears that jurors are not sensitive to the effects different levels of intoxication can have on recall; i.e., BACs below the drink drive limit for England, Wales and Northern Ireland are not particularly detrimental. Additionally, mock juror participants viewed a witness as significantly more credible and generally a better witness it they provided a longer and more detailed testimony. From a practical perspective, despite this thesis indicating that the testimony of an intoxicated witness is as accurate, although perhaps less complete than a sober witness' testimony, jurors are still likely to view an intoxicated witness' testimony as less credible and potentially unnecessarily disregard their account.

8.4. Methodological Issues

This thesis provides a preliminary investigation of AMT with a more encompassing definition of salience and examines intoxicated witnesses throughout the legal process. Yet due to methodological limitations and practical constraints, a degree of caution should be noted regarding the reliability of the findings presented in this thesis.

8.4.1. Stimuli event medium.

As noted earlier in this thesis, practical issues such as health and safety requirements dictated the use of a videoed rather than a live stimuli event (see section 1.4.1. Eyewitness research methods). This has clear disadvantages in terms of the forensic relevancy of the research and with only one event used throughout this thesis it is possible that the findings are a result of that particular simulated crime. Additionally, as the crime was not witnessed live, AMT's predicted role for arousal in reducing attention to low salience information was not explored (Steele & Josephs, 1990). Consequently, the fact that this thesis' findings do not follow the pattern of recall predicted by AMT, may partially be due to the lack of heightened arousal that is often associated with witnessing a crime (Deffenbacher et al., 2004). There are advantages though to using a videoed event including the fact that it allows for greater control over, for example, viewing conditions, details of the crime and timing of the event. This also ensured consistency between participants and across studies therefore allowing comparisons between BACs to be made (Chae, 2010). Further to this, research suggests that although laboratory experiments may overestimate the memory abilities of witnesses compared with a live event, a video stimuli event is able to simulate the key memory performance details of a genuine crime (Ihlebæk et al., 2003).

8.4.2. Selection of high and low salience information.

It is important to treat with caution the conclusions drawn in relation to AMTs ability to explain the recall pattern of intoxicated witnesses, due to the choice of information classed as low salience, i.e., 'an orange and a white mug were shown on the laptop desk'. As previously indicated, within studies 2a, 2b and 3, low salience recall was poor even for sober witnesses. As a consequence, the influence of floor effects may have contributed to the lack of support for AMT within this thesis. When an information 'type' definition of salience was applied in study 4, however, there was some support for AMT. Whilst severe intoxication (M_{BAC} = .14%) resulted in a significantly less complete recall of surrounding details compared to sober individuals, there was not a significant impairment in the recall of objects, action and person details. This effect, though, was not apparent with moderately intoxicated witnesses (M_{BAC} = .06%), and no effect of intoxication was evident in relation to the recall accuracy of surrounding, object, person or action details. These conflicting findings further suggest that floor effects in relation to low salience details may have been a factor in the lack of support for AMT, at least with severely intoxicated witnesses.

8.4.3. Alcohol tolerance.

Due to ethical requirements, and concerns for the researcher's safety, it was necessary for students to participate as witnesses in studies 2a, 2b, 3 and 4. Undergraduates as a population though tend to consume more units of alcohol per week on a regular basis than their non-student peers (Gill, 2002; Richards, Fox, Roberts, Fletcher, & Goddard, 2004). Consequently, due to their regular drinking, the students that participated in this thesis research may have built up a greater tolerance to alcohol. This in turn may have reduced their sensitivity to the effects of alcohol, such that it would take higher quantities of alcohol to achieve the same positive and negative effects of intoxication. The lack of effect of intoxication in studies 2a and 2b may therefore be because students were used to regularly achieving these 'lower' levels of intoxication. As a result, they may have become accustomed to adopting behaviours which allowed them to compensate for any detrimental effect intoxication may have caused. In the real-world though, police officers would not have a means to measure a witness' alcohol tolerance. From a theoretical perspective, however, this information would have been beneficial in order to further understand how alcohol affects recall.

8.4.4. Gender differences.

The participant sample in studies 2a, 2b, 3 and 4 were predominately female (76-85%) which may have had an effect on the conclusions drawn within this thesis. Although the proportion of female participants is higher than other alcohol and forensic recall studies (Hagsand et al., 2013a; Schreiber Compo et al., 2011; Van Oorsouw & Merckelbach, 2012), it is in line with the alcohol and forensically related research that have been conducted in the UK with a mixed gender sample (Harvey et al., 2013a, 2013b). There is, however, conflicting evidence as to the inter-related effects of gender and alcohol upon recall. General memory research suggests that the cognitive abilities of women begin to be impaired at lower doses of alcohol than men (Mumenthaler, Taylor, O'Hara, & Yesevage, 1999). In terms of alcohol and eyewitness research, whilst Hagsand et al. (2013a) found no effect of gender on recall completeness, research conducted by Hildebrand Karlén et al. (2015) found alcohol lowered the completeness of female, but not male recall. Importantly, though, Hildebrand Karlén et al. found a significant difference between male and female BACs, whilst Hagsand et al. (2013a) found no such effect of gender on BAC. As with Hagsand et al. within this thesis, analyses indicated that there was not a significant difference in the BACs of male and female participants, and that the effects of alcohol on recall completeness were the same irrespective of participant gender. This tentatively suggests that having a predominately

female sample had little effect upon the conclusions that have been drawn in this thesis. The male sample size, however, was very small and therefore requires further research to confirm this lack of effect of gender.

8.5. Future Studies

The research within this thesis provides an initial assessment of AMT as a means to explain the recall of an intoxicated eyewitness where salience is determined by semantic meaning and spatial location. The studies also provide a preliminary investigation of mock jurors' perceptions of intoxicated witnesses, and the effectiveness of the ECI to aid the sober recall of an intoxicated witness. While this thesis has addressed and answered a number of queries, there are additional questions that have been raised which merit further examination.

8.5.1. Stimuli event and salience.

Prior to this body of research, the four studies that have tested AMT with intoxicated eyewitnesses (Flowe et al., 2016; Harvey et al., 2013a, 2013b; Schreiber Compo et al., 2011) have done so by classifying information to be recalled as either central or peripheral based on a 'type' or spatial definition. Although this thesis adopts a more encompassing definition of salience, the lack of interaction between information salience and intoxication level (up to M_{BAC} s of .09%) is consistent with previous research (Flowe et al., 2016; Harvey et al., 2013a) at these intoxication levels. At higher levels of intoxication, the study findings are also in partial agreement with past alcohol and forensic recall research (Read et al., 1992; Van Oorsouw & Merckelbach, 2012). However, as mentioned earlier in this chapter concerns regarding floor effects in relation to low salience information, may limit the reliability of this thesis' findings in relation to AMT's ability to explain the recall pattern of intoxicated witnesses. It is therefore proposed that, studies 2a, 2b and 3 are replicated using this thesis' means of classifying details as high and low salience but using a different stimuli event. In adopting a definition of salience that takes into account both spatial location and semantic meaning, what details are classed as high or low salience is very dependent on the event or the crime that is actually witnessed. Consequently, a detail in one event may be of little to no importance, whilst in another it is of high salience. Testing this definition across multiple event scenarios is therefore necessary. Further to this, comparing each participant's pattern of recall in relation to information salience and also information type would allow the two means of testing AMT to be compared. A sober condition should also be added to study 3 and if practical constraints allow, a live event with non-students would also improve forensic relevancy.

8.5.2. Recall completeness and accuracy.

As seen in previous research, and discussed earlier in this chapter (see section 8.3.1.1. Blood alcohol concentrations), alcohol consumption was not seen to be particularly problematic to the recall of moderately intoxicated witnesses. Those individuals who were severely intoxicated, however, were less complete although no less accurate in their free recall. At present, though, it is unknown whether witnesses with higher intoxication levels are adopting a more stringent criterion to determine what information they provide in their testimony, or whether they actually just recall fewer details. With the ECI increasing the recall accuracy and completeness of intoxicated witnesses it would appear that these individuals are applying a stricter criterion when deciding what to report, but this does need to be investigated further. It is therefore proposed that future studies address this question in order to determine what causes the less complete account of intoxicated witnesses. Is it due to them intentionally not reporting all the details that they can recall but are uncertain of, or do these higher BAC witnesses have fewer memories of the event? This would also provide more information on the suggestion made previously that the effect of alcohol on recall is a problem of memory accessibility rather than availability (see section 8.3.2. Fragmentary Blackouts or Acute Alcohol Amnesia). Looking at how the witnesses believe alcohol affects memory may also provide an indication as to the individuals' motivation for not reporting all the information that they could recall, and potentially highlight a means to further improve their credibility with jurors.

8.5.3. Repeated interviewing.

In study 1 of this thesis a majority of police officers indicated that they recorded initial details from the witness whilst they were intoxicated, and later completed a full interview when sober. Around 10% of officers though stressed that they waited until the witness was sober before conducting any form of interview. Consequently, the testimony that is heard in court may be the first or the second account that the witness has provided to the police. Whilst previous research (Flowe et al., 2016; Hagsand, et al., 2016; La Rooy et al., 2013; Yuille & Tollestrup, 1990) has looked at repeated interviewing with intoxicated witnesses, in each study witnesses completed the same recall technique when intoxicated and sober. It is therefore proposed that future research investigate the effects of repeated interviewing on intoxicated recall, applying the two approaches favoured by officers, to determine how this influences the completeness and accuracy of intoxicated witness recall.

8.5.4. Eyewitness credibility.

Study 5 of this thesis indicated that whilst mock jurors rated intoxicated witnesses as less credible, it was the knowledge that alcohol had been consumed, rather than fundamental differences in the testimonies, that was the cause of these poorer credibility ratings. It might therefore be advantageous to replicate study 5 but include a measure of a jurors own pre-existing stereotypes. This would allow researchers to further understand the extent to which a mock juror's own beliefs affect their perceptions of an intoxicated witness. Additionally, a more in-depth study of the key aspects of the court case (for example, juror deliberations) would be beneficial, as it would indicate how individual mock jurors' beliefs about the effects of alcohol influence decision-making. With this thesis indicating that alcohol only affects recall completeness and that this is only at severe levels of intoxication, it is therefore proposed that future research also seek ways of improving mock juror perceptions of intoxicated witness credibility. For example, a replication of study 5 is advised with an additional condition where mock jurors are provided with expert testimony explaining the effects of alcohol on eyewitness recall to see if this may help improve intoxicated witness credibility.

8.5.5. Blood alcohol concentration.

From a criminal justice perspective, it is important to know at what BAC a witness' recall is no longer as reliable or complete as that of a sober individual. With this information, the CPS, officers, lawyers, judges and jurors would have an objective means of determining whether the information a witness provides can be depended on. The studies within this thesis suggest that moderate levels of intoxication, up to around the drink drive limit for England, Wales and Northern Ireland, are not particularly detrimental to recall. With higher BACs, at nearly double the drink drive limit (M_{BAC} = .14%), though, alcohol was seen to affect recall completeness but not accuracy. From this thesis, however, it is not possible to determine the average BAC at which alcohol began to impair the completeness of a witness' recall. In order to achieve this goal, a possible first step would be to collate the data from this thesis and other alcohol and eyewitness memory studies. A meta-analysis of alcohol and eyewitness recall studies is therefore suggested, but as discussed earlier in this chapter (section 8.4.3. Alcohol tolerance) there are individual differences in relation to alcohol tolerance that may make establishing a specific BAC extremely difficult.

8.6. Recommendations for the Criminal Justice System

The findings of this thesis enable a number of important recommendations to be made to the Criminal Justice System, regarding their procedures for interacting with, and obtaining as

much reliable information as possible from, intoxicated witnesses. The results of this body of research suggest that moderate levels of intoxication, up to around the drink drive limit for England, Wales and Northern Ireland, are not particularly problematic in terms of the accuracy and completeness of an eyewitness' recall. Higher and more severe levels of intoxication though tend to negatively affect recall completeness but not accuracy. As with sober witnesses, this thesis also suggests that the ECI (as administered by police officers in England and Wales for less serious crimes) can be used to enhance the recall of both moderate and severely intoxicated witnesses.

The first recommendation refers to the guidelines provided to police officers. At present, in light of the Turnbull guidelines (*R v. Turnbull, 1976*), police officers in England and Wales are trained to describe in their accounts how much alcohol the witness had drunk. With no other guidelines or legal backing though, it is left to each officer to determine how best to deal with the individual. The results of study 1 of this thesis provide some evidence of a lack of consistency in how officers choose to deal with these intoxicated witnesses. It is therefore recommended that the CJS in England and Wales seriously consider providing officers with clear guidelines on how to deal with intoxicated witnesses, even if those guidelines do not follow all the recommendations detailed below. Adopting a standard force-wide approach in England and Wales would ensure greater consistency in relation to how information from intoxicated witnesses is obtained, and would help ensure that courts do not disregard witness information solely because of how that information was collected.

The second recommendation pertains to how witnesses are interviewed. At the moment, Government guidelines advise that vulnerable witnesses, made so through their use of alcohol, should be interviewed using the ECI (MoJ, 2011). However, previous research suggests that police officers often administer a modified or shortened version of this interview technique, due to some aspects being viewed as less effective and time-consuming (Dando et al., 2008). The findings of thesis study 4, though, indicate that this modified ECI is still effective in improving the recall accuracy and completeness of even severely intoxicated witnesses. Consequently, it is recommended that if a witness has consumed alcohol then they should be interviewed with the ECI, even in the modified form, in order to obtain as much accurate information as possible from the witness.

The third recommendation relates to how the recall abilities of intoxicated witnesses are perceived by those in the CJS. Research suggests that individuals expect alcohol consumption to cause cognitive impairments (Adams & McNeil, 1991), with higher intoxication levels anticipated to lead to increasingly more negative effects (George & McAfee, 1987; Southwick et al., 1981). Further to this, studies 1 and 5 of this thesis indicate

that both police officers and mock jurors believe that intoxicated witnesses will be less accurate in their recall than a sober witness. However, the research within this thesis also provides evidence that suggests that an intoxicated witness' recall is not necessarily any poorer than that of a sober witness. It is therefore recommended that police officers, jurors, and other members of the CJS be alerted to this fact, through for example, the publication of this thesis' findings in journals and on the University's website. Imparting this information to witnesses who have consumed alcohol may also be beneficial. As officers in study 1 indicated that intoxicated witnesses often felt their testimony would not be believed in court, then providing them with information that details the effects of alcohol on recall may assist in obtaining a testimony from the individual. Consequently, educating all parties on the limited effect moderate intoxication has on witness recall may help ensure that the testimony of a valuable witness is not disregarded purely because they were intoxicated at the time of the crime.

8.7. Conclusions

The first aim of this thesis was to explore the ability of AMT to explain the recall pattern of intoxicated witnesses using a complex and forensically relevant event. As opposed to previous research, however, salience within this thesis was determined by spatial location and semantic meaning rather than information type. Previous research has found mixed support for AMT's predicted pattern of recall impairments across a range of stimuli types and recall methods. Yet this thesis suggests that when an arguably more AMT consistent definition of salience is applied, then it is high rather than low salience details that are impaired to the greater degree by intoxication. It is difficult to reconcile these findings with the alcohol induced narrowing of attention proposed by AMT. In light of this, it is proposed that acute alcohol amnesia is an alternative and potentially more appropriate means of accounting for alcohols effect on recall. Further to this, this thesis indicates that BACs below the drink drive limit for England, Wales and Northern Ireland are not particularly detrimental to recall, but that BACs above the drink drive limit for England, Wales and Northern Ireland reduce recall completeness but not accuracy.

The second aim of this thesis was to investigate whether the memory deficits caused by intoxication could be countered, through the interview techniques that are employed. With participants potentially having used 'spontaneous' context reinstatement to aid their recall in studies 2a and 2b, a modified ECI procedure was adopted in study 4. Only two previous studies had employed any aspect of the CI with intoxicated witnesses and, in both cases, it is unclear exactly which and to what extent the CI mnemonics were applied. This

thesis indicated that the 'report everything' and 'mental reinstatement of context' mnemonics of the ECI are able to improve the accuracy and completeness of moderately and severely intoxicated witnesses. In light of this finding, this thesis argues that alcohols effect on recall pertains to impairing the accessibility of memories rather than their availability.

The third aim of this thesis was to look at the end of the legal process and to investigate whether intoxication affected how jurors perceived the credibility of these witnesses. Whilst no previous research has looked at how mock jurors view the recall of an intoxicated witness, this thesis suggests that there is nothing fundamental to their testimony that affects how it is viewed by jurors. Nevertheless, when a mock juror is made aware that the witness was intoxicated at the time of the crime, then the witness is deemed less credible, therefore suggesting that jurors draw on stereotypes when judging witness credibility, i.e., that alcohol unilaterally impairs recall.

Ultimately from a criminal justice perspective this thesis suggests that key elements of the Criminal Justice System (i.e., police officers and jurors) consider individuals who have consumed alcohol to make poorer witnesses, irrespective of their level of intoxication. Studies within this thesis though suggest that the effects of alcohol on recall are not as simple as merely having a detrimental effect. In fact, the testimony of an intoxicated witness with a BAC up to the drink drive limit for England, Wales and Northern Ireland is likely to be just as complete and accurate in their recall as a sober witness. Even with BACs higher than the drink drive limit, although the witness may recall fewer details, their testimony is likely to be just as accurate as that of a sober witness. Intoxication therefore does not automatically mean that a witness' recall cannot be relied upon, or that their testimony should not be heard in court. However, to help ensure that as many correct details as possible are obtained from an intoxicated witness police officers should administer the ECI, with the mental reinstatement of context mnemonic wherever possible. Ultimately, this thesis suggests that the testimony of an intoxicated eyewitness (up to M_{BAC} of .14%) is no less accurate than that provided by a sober witness, and can be relied upon by those in the Criminal Justice System to the same extent as a sober eyewitness.

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APPENDICES

Appendix A: Study 1 Questionnaire

1. **How old are you?**
   Please enter your response below

2. **What is your gender?**
   Please select one

   ☐ Male ☐ Female

3. **What rank are you in the police?**
   Please detail below

4. **How many years have you worked for the police?**
   Please detail below

5. **On average, how many witnesses do you interview in *a typical month*?**
   Please enter your response below

6. **In a *typical month*, how many witnesses do you interview who were intoxicated at the time of the crime?**
   Please enter your response below

7. **In a *typical month*, how many witnesses do you take an initial statement from whilst they are still intoxicated?**
   Please enter your response below

8. **Based on your experience, how common is it for a witness to be intoxicated?**
   Please select a response from below

   ☐ Very common ☐ Common ☐ Unusual ☐ Very unusual

9. **In your experience, in which types of crimes do you typically encounter intoxicated witnesses?**
   Please select all that apply

   ☐ Rape/attempted rape
   ☐ Assault
   ☐ Robbery
   ☐ Murder
   ☐ Other (please detail):
   ☐ Motor vehicle offences
   ☐ Volume crimes
   ☐ Not applicable
   ☐ I don't know

10. How do you determine if a witness is intoxicated?

Please tick all that apply

- ☐ Physical symptoms such as blood shot eyes, slurred speech or loss of balance
- ☐ Breathalyser
- ☐ Admits intoxication
- ☐ Blood test
- ☐ I don't know
- ☐ Observed consuming alcohol
- ☐ Not applicable
- ☐ Other (please explain: _____

11. Do you ever use a breathalyser on a witness who you believe is intoxicated?

Please enter your response below

- ☐ Yes; what is their average breath alcohol level? _____
- ☐ No
- ☐ I don't know
- ☐ Not applicable

12. If a witness has drunk alcohol, how do you decide if they are competent enough to be interviewed?

Please select all responses that apply

- ☐ Blood or breath alcohol test
- ☐ Experience from previous witnesses/victims
- ☐ Let the witness/victim decide
- ☐ Own personal experience
- ☐ Common sense
- ☐ Other (please explain): _____

13. What are your department's standard procedures for interviewing witnesses if they are intoxicated?

Please select a response from below

- ☐ The same as for sober witnesses
- ☐ I don't know
- ☐ Different from sober witnesses (please explain): _____

14. Do you usually interview intoxicated witnesses:

Please select a response from below

- ☐ Whilst they are still intoxicated
- ☐ I don't know
- ☐ Once they "sober up"
- ☐ Not applicable
- ☐ Initial details whilst intoxicated and full interview when sober
- ☐ It depends (please explain): _____

15. If interviewed repeatedly, when do intoxicated witnesses provide the largest amount of information (irrespective of accuracy)?

Please select a response from below

- ☐ Soon after the crime (while still intoxicated)
- ☐ I don't know
- ☐ Later on when sober
- ☐ Not Applicable

16. How effective do you think these procedures are at obtaining useful information from the intoxicated witness?

1 = Not at all effective 10 = Extremely effective

1 2 3 4 5 6 7 8 9 10

17. Are there any changes you would make to the current procedures for interviewing intoxicated witnesses?

Please select your response from below

- ☐ Yes (please provide details): _____
- ☐ No
- ☐ I don't know

18. Based on your experience, how accurate are statements provided by witnesses if they are *sober* at the time of the crime?

1 = Not at all accurate 10 = Extremely accurate

1 2 3 4 5 6 7 8 9 10

19. Based on your experience, how accurate are statements provided by witnesses if they are *intoxicated* at the time of the crime?

1 = Not at all accurate 10 = Extremely accurate

1 2 3 4 5 6 7 8 9 10

20. If the witness is *sober* at the time of the crime, how likely is it that the case will make it to court (if there is no other evidence)?

1 = Not at all likely 10 = Extremely likely

1 2 3 4 5 6 7 8 9 10

21. If the witness is *intoxicated* at the time of the crime, how likely is it that the case will make it to court (if there is no other evidence)?

1 = Not at all likely 10 = Extremely likely

1 2 3 4 5 6 7 8 9 10

22. Are there any issues or experiences with intoxicated witnesses that have not been addressed in this survey which you think are important?

Please select a response from below

- ☐ Yes (please explain): ☐
- ☐ No
- ☐ I don't know
- ☐ Not applicable

23. In your experience what demographic groups most represent intoxicated witnesses?

Gender: ☐

Age: ☐

Ethnicity: ☐

Any other characteristics: ☐

Appendix B: Study 2a, 2b, 3 and 4 Screening Form

Name: ……. Pp Number: ……

Weight (in kg): ……..

Age: ……

Gender: Male / Female

1. Have you consumed the equivalent of at least 6-9 units of alcohol in the past 3 months on a single drinking occasion? (Use the chart below to determine number of units per drink).

   YES/NO

Please note that 1 standard drink = 1 unit of alcohol. So, for example, a pint of regular beer or lager is equal to 2 standard drinks or 2 units. A description of a standard drink is given in the box above.

2. Do you have any medical condition or have received any medical advice that specifies that you should not consume alcohol?

   YES/NO

3. Are you or could you be pregnant?

   YES/NO

4. Have you been given any professional advice to stop or reduce the amount of alcohol you drink?

   YES/NO

5. Is there any other reason why you shouldn't consume alcohol? (please give details if Yes)

   YES/NO

……

……

.

Appendix C: Study 2a, 2b & 3 Recognition Test

THE UNIVERSITY OF WINCHESTER

Pp Number: _____

Recognition Test

Thank you for agreeing to take part in this study.

On the following 6 pages, please indicate whether each of the 40 statements is either true or false.

When deciding whether a statement is true or false please respond based on your recollections of the video.

In addition for each statement please also indicate the confidence you have in the accuracy of your true or false response.

The 1 to 5 scale runs from:

1 = total lack of confidence to 5 = total confidence.

Statement 1: The man was wearing black jeans

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 2: A poster in the second classroom said 'working with teaching assistants'

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 3: He carried his bag on his right shoulder

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 4: A fire extinguisher was on the wall in the locker corridor

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 5: There were two posters on the first classrooms window.

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 6: The man placed money in his back right trouser pocket

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 7: The man stole a laptop off a desk

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 8: The man tried opening three doors in the second classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 9: The world was shown on a poster in the first classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 10: The man entered the building through a blue and glass door

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 11: There was an overhead projection monitor at the front of the first classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 12: From the locker corridor a sign indicated the fire exit was to the left

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 13: As the man left the first classroom there was a blue sign on the door

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 14: As the man entered the building a bird walked up the grass verge outside

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 15: The man walked round the first classroom anti clock-wise

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 16: The man used his left hand thumb to test the locker doors

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 17: There was no cable attached to the laptop

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 18: There was a red chair and two black chairs on the tables in the first classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 19: He looked into a blue box when he entered the second classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 20: The wall of the first classroom showed a yellow border with no poster in it

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 21: The man looked at three notebooks in the first classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 22: A poster in the second classroom was entitled 'promoting self-confidence'

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 23: The mans' bag was black

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 24: The door the man entered the building through opened into of the corridor

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 25: There were two flipcharts in the first classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 26: The man wore a V-neck t-shirt

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 27: The man looked in a white pencil case in the first classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 28: The man wore a ring on his right hand

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 29: The man was wearing a black jacket

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 30: There were double fire exit doors in the first classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 31: The man dropped the teddy bear on the floor

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 32: Behind the desk-top computer in the first classroom a poster had paper feet attached around the top

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 33: There was one chair at the desk that had a laptop on it

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 34: The man attempted to pry open the locks on two lockers

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 35: A blue coat was placed over the back of a chair in the second classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 36: The man wore a watch on his right wrist

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 37: The man stole money from a purse

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 38: An orange and a white mug were shown on the laptop desk

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 39: Two window blinds were closed in the first classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Statement 40: $E=MC^2$ was illuminated on the wall in the first classroom

True False

1……..2……..3……..4……..5

Total lack of confidence Total confidence

Appendix D: Study 2a and 2b Information and Consent Form

Pp Number: ……..

Information/Consent Form

We are researching the effects of mild alcohol intoxication on memory. The study consists of two stages, one week apart. In the first stage you may be given doses of alcohol which will make you mildly intoxicated (just over the legal limit for driving). During this stage you will be required to watch a short video. If you have drunk alcohol, you will then be asked to stay until your breath alcohol level has returned to below the drink drive limit for England (or you have signed a release disclaimer form). The second stage, a week later, will involve a short task.

You will only be allowed to participate if you meet the following requirements:

You are a not a teetotaller.

You are not taking any medication that prohibits you from drinking alcohol.

You are not an alcoholic or a recovering alcoholic.

You are not suffering from an alcohol related illness.

You are not pregnant.

You are not suffering from any medical condition that prohibits you from drinking alcohol.

Your participation is voluntary and you may withdraw at any time. All data collected in this study will be held securely and your anonymity and privacy will be protected at all times. Further information is available upon request from either Deborah Crossland: email D.Crossland.05@unimail.winchester.ac.uk or Wendy Kneller: email Wendy.Kneller@winchester.ac.uk

We are very grateful for your support, without which we could not undertake this work.

Thank You, Deborah Crossland & Wendy Kneller

Consent Form

I have read the above information. I understand that I may withdraw my consent and discontinue participation at any time.

I give my consent to participate in this research YES NO

(Please circle above as appropriate)

Signature _____ Date_____

Name (Please print) _____ Pp Number _____

Appendix E: Study 2a and 2b Intoxication Release Disclaimer Form

THE UNIVERSITY OF WINCHESTER

Pp Number: ……..

Release disclaimer form

Discharge disclaimer

I understand that I have consumed alcohol during the course of this study and have been advised not to drive or take part in activities that might be dangerous under the influence of alcohol for the rest of the day. I have been advised by the researcher to remain in the building until my breath alcohol level falls to below 0.30mg/L. I have decided not to follow the advice of the researcher and wish to leave. In doing so I take full responsibility for my actions.

Current breath alcohol level: ……..

Rating of intoxication (please circle one):

Not at all intoxicated
Mildly intoxicated
Moderately intoxicated
Very intoxicated

Signature: ……. Date: …….....

Name (Please print): …….

Appendix F: Studies 2a and 2b Written Free Recall Task

Pp Number: ……

Please write down as much information as you can remember from the video you saw last week, no matter how small or trivial you think those details may be. Additionally, please include any information you can recall in relation to the actions and appearance of the man, and his environment. There is no time limit to this task. Thank you.

Appendix G: Studies 2a, 2b and 3 Debrief Form

THE UNIVERSITY OF WINCHESTER

Effects of alcohol on memory: Debriefing Information Form

The purpose of this research was to investigate the effects of alcohol intoxication on an individual's recall for central and peripheral details of an event. Although it is generally accepted amongst legal professionals that alcohol impairs memory (e.g., Kassin, Tubb, Hosch, & Memon, 2001), there is in fact very little research that has examined this issue. As indicated by Malpass et al. (2008) to date only three published studies have investigated the effects of alcohol on an eyewitness' memory (Dysart, Lindsay, MacDonald, & Wicke, 2002; Read, Yuille, & Tollestrup, 1992; Yuille & Tollestrup, 1990). In each of these studies, mild intoxication during the observation of an event resulted in poorer recall accuracy. In order to explain their conclusions the researchers drew upon the alcohol myopia theory (AMT) (Steele & Josephs, 1990). This hypothesis proposes that when an individual is intoxicated a disproportionate amount of attention is given to immediate central cues, whilst weaker peripheral cues receive less attention.

The AMT however has its roots in explaining the *behaviour* of intoxicated individuals rather than as an explanation of the *cognitive* functioning that is altered through alcohol. Despite this, alcohol and eyewitness research has drawn upon AMT without a comprehensive testing of the validity of using such a hypothesis in relation to eyewitness memory. Of the published studies that have looked at alcohol and recall, Dysart et al. (2002) looked specifically at the accuracy of an intoxicated witness' line-up decisions rather than the recall of the whole observed event. As a result the AMT was not tested in relation to the details remembered by individuals. Yuille and Tollestrup (1990) in contrast did start to examine the effects of alcohol on the types of items recalled and found those in the alcohol condition provided significantly more details that were unscorable in terms of accuracy. In their full analyses however the researchers dropped their classification of items as either 'actions' or 'descriptions' in favour of comparing the 'total recall accuracy' of sober and intoxicated participants. As a result this study failed to test the AMT in relation to the central and peripheral details recalled by intoxicated individuals. Read, Yuille and Tollestrup (1992) also attempted to look at an individual's recollection of central and peripheral information once intoxicated. They choose to define peripheral information though as the recall of a 'bystander' whilst central information was the participant's recollection of an individual they interacted with in the

study. Consequently this research focused, once again, on the recall of 'persons' rather than all aspects of the observed event.

Although these three studies drew upon alcohol myopia as a tool to explain their conclusions, the researchers have provided no data that supports the appropriateness of adopting this theory to eyewitness memory. The purpose of this current research is therefore to look specifically at the central and peripheral recall of sober, mildly intoxicated and placebo participants. The aim is to determine whether the pattern of recall indicated by the AMT (that intoxication results in poorer peripheral recall) is actually found in relation to the memory of eyewitnesses.

Deborah Crossland

References

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APPENDIX H: Study 3 and 4 Effortful and Automatic Processing Tasks

Effortful and automatic processing word List

Pp Number: ……..

Church	Money	Pupil	Cabin
Bottle	Engine	Baby	Star
Child	Bottle	Coffee	Money
Doctor	Star	Star	Fur
Engine	Cotton	Fur	Cabin
Horse	Star	Cotton	Baby
Church	River	Pupil	Fur
Tower	Engine	Green	Cabin
Horse	Street	Lake	Horse
Cotton	Lake	Street	Arm
Tower	Money	Tower	Star
Baby	Child	Engine	Doctor
Engine	Cotton	Baby	Cotton
Tower	Letter	Cabin	Engine
Child	Tower	Child	Coffee
Letter	Cat	Bottle	Street
Horse	Cat	Party	Tower
Circle	Plant	Coffee	Pupil
Arm	Cotton	Church	Cotton
Mountain	Letter	Doctor	Baby
Fur	Church	Circle	River
Street	Flower	Green	
Lake	Lake	Cabin	

Effortful and automatic processing recall sheet **Pp Number**: ……..

Free Recall		Frequency
	Arm	
	Baby	
	Bottle	
	Cabin	
	Cat	
	Child	
	Church	
	Circle	
	Coffee	
	Cotton	
	Doctor	
	Engine	
	Flower	
	Fur	
	Green	
	Horse	
	Lake	
	Letter	
	Money	
	Mountain	
	Party	
	Plant	
	Pupil	
	River	
	Star	
	Street	
	Tower	

APPENDIX I: Study 3 and 4 Information and Consent Form

Pp No: …….

Information/Consent Form

We are researching the effects of intoxication on memory. The study consists of two stages, one week apart. During the first stage, whilst on your night out in the Student Union, you will be breathalysed and asked to complete a couple of word tasks and watch a short video. Whether you drink alcohol or not during the evening you are still able to take part, but please refrain from drinking alcohol for 20 minutes before your assigned participation time. The second stage, a week later, will involve a short task that will be recorded by dictaphone.

You will only be allowed to participate if you meet the following requirements:

You are a not a teetotaller.

You are not taking any medication that prohibits you from drinking alcohol.

You are not an alcoholic or a recovering alcoholic.

You are not suffering from an alcohol related illness.

You are not pregnant.

You are not suffering from any medical condition that prohibits you from drinking alcohol.

Your participation is voluntary and you may withdraw at any time. All data collected in this study will be held securely and your anonymity and privacy will be protected at all times. Further information is available upon request from either Deborah Crossland: email Deborah.Crossland@winchester.ac.uk or Wendy Kneller: email Wendy.Kneller@winchester.ac.uk .

We are very grateful for your support, without which we could not undertake this work.

Thank You, Deborah Crossland & Wendy Kneller

Consent Form

I have read the above information. I understand that I may withdraw my consent and discontinue participation at any time.

I give my consent to participate in this research YES NO

(Please circle above as appropriate)

Signature _____ Date_____

Name (Please print) _____ Pp Number _____

APPENDIX J: Study 4 Interview Protocols

Cognitive Interview Protocol

Greet and personalise the interview (Phase 1)

"Hello … (*participant name*) … Thank you for returning this week".

"Last week when you signed the consent form you agreed for today's task to be recorded by dictaphone. Can you please confirm that you are still happy for this to happen?"

… (*Participant response*)…

"Thank you."

Rapport building (Phase 2)

Ask interviewee some questions about themselves and offer information about myself …

General small talk using open-ended questions to establish rapport – possible topics: weather, general health, what they have been doing today, summer holidays, pets.

… When they are fairly relaxed move to phase 3 …

Explain the purpose of the interview (Phase 3)

"Do you know why you are here today?"

... (*Participant response*)…

"I am trying different ways of interviewing people to work out which way helps people remember the most detail".

"I would like to apologise for reading from my notes. I am only doing this to make sure that all the people helping are given the same information".

"During this interview I'm going to ask you to tell me what you can remember about the film you saw last week, I will take some short notes while you are talking and then use them to ask you some questions based on what you tell me".

"I would also like to remind you that this interview could take up to 20 minutes"

"Before we get started is there anything that you would like to ask me?"

… (*Participant response*)…

"Are you ready to start?"

… (*Participant response*)…

"What I would like to do now is to ask you about the film you saw last week"

Free recall + Mental Context Reinstatement (Phase 4 – Recall attempt 1)

"In a moment I am going to ask you to begin and to tell me what you remember about the film, but before we start I would like to try and help you to remember as much as you can"

"As I talk to you I would like you to think about each of the things I say, as I say them"

"Start by closing your eyes, staring at the floor or looking at a blank wall. Whichever makes you most comfortable. This will help you to think about each of the things I say to you"

"To begin I would like you to try to think back to the day that you saw the film….like you would do if you had lost something and were trying to remember the last time you saw it"

"Think about that day" … (*pause*) …

"What had you been doing that morning" … (*pause*) …

"What was the weather like" … (*pause*) …

"Who had you seen or spoken to that day" … (*pause*) …

"Think about what you had been doing immediately before coming up to see the film" … (*pause*) …

"Now I would like you to think about the room in which you saw the film" … (*pause*) …

"Try and get a picture of that room in your mind" … (*pause*) …

"What did that room look like? … (*pause*) …

"Did you smell anything as you entered the room? … (*pause*) …

"Did you notice anything in particular?" … (*pause*) …

"Think about the layout of that room … (*pause*) …

"Where the screen was" … (*pause*) …

"Where you sat to watch the film" … (*pause*) …

"Try to remember where I was sitting" … (*pause*) …

"What was I doing" … (*pause*) …

"What did we speak about?" … (*pause*) …

"Now if you've got a good picture of that room in your mind I would like you to picture the screen" … (*pause*) …

"Think about how you felt as the film started" … (*pause*) …

"What you thought might happen" … (*pause*) …

"Now focus on the actual film from the very beginning" … (*pause*) …

"Think about what you saw" … (*pause*) …

"What did you hear as you were watching the film" … (*pause*) …

"When you have clear picture in your mind I would like you to tell me everything you can remember about that film"

"Remember, that it is important that you never guess or make anything up. If you can't remember or don't know please just say so."

When participant has stopped talking pause for 10 seconds

Questioning (Phase 5 – Recall attempt 2)

"Thank you for doing that, you have given me a lot of information, that's really great".

"Based on the things you have just told me I would like to ask you some more questions"

"As I mentioned before I am going to use the notes I made to guide me".

"If you can't remember something don't make it up, it is fine to say I don't know"

… Ask one open question about each main topic mentioned by the participant during free recall …

… (e.g., you mentioned there was a man. Can you tell me more about what he looked like?)

… Order guided by interviewee's free recall …

… Only ask the question if the interviewee free recalled the detail …

Closure (Phase 6)

"Just before we finish this interview is there anything else you wish to add or change"

… (*pause*) …

"Do you have any questions?" … (*pause*) …

"Thank you for that interview … (*participant name*) … you did really well"

Structured Interview Protocol

Greet and personalise the interview (Phase 1)

"Hello … (*participant name*) … Thank you for returning this week".

"Last week when you signed the consent form you agreed for today's task to be recorded by dictaphone. Can you please confirm that you are still happy for this to happen?"

… (*Participant response*)…

"Thank you."

Rapport building (Phase 2)

Ask interviewee some questions about themselves and offer information about myself …

General small talk using open-ended questions to establish rapport – possible topics: weather, general health, what they have been doing today, summer holidays, pets.

… When it is clear that they are fairly relaxed move to phase 3 …

Explaining the purpose of the interview (Phase 3)

"Do you know why you are here today?"

... (*Participant response*)…

"I am trying different ways of interviewing people to work out which way helps people remember the most detail".

"I would like to apologise for reading from my notes. I am only doing this to make sure that all the people helping are given the same information".

"During this interview I'm going to ask you to tell me what you can remember about the film you saw last week, I will take some short notes while you are talking and then use them to ask you some questions based on what you tell me".

"I would also like to remind you that this interview could take up to 20 minutes"

"Before we get started is there anything that you would like to ask me?"

… (*Participant response*)…

"Are you ready to start?"

… (*Participant response*)…

"What I would like to do now is to ask you about the film you saw last week"

Free recall (Phase 4– Recall attempt 1)

Remember, that it is important that you never guess or make anything up. If you can't remember or don't know please just say so."

"When you are ready please tell me what you can remember about the film you saw last week."

When participant has stopped talking pause for 10 seconds

Questioning (Phase 5– Recall attempt 2)

"Thank you for doing that, you have given me a lot of information, that's really great".

"Based on the things you have just told me I would like to ask you some more questions"

"As I mentioned before I am going to use the notes I made to guide me".

"If you can't remember something don't make it up, it is fine to say I don't know"

… Ask one open question about each main topic mentioned by the participant during free recall …

… (e.g., you mentioned there was a man. Can you tell me more about what he looked like?)

… Order guided by interviewee's free recall …

… Only ask the question if the interviewee free recalled the detail …

Closure (Phase 6)

"Just before we finish this interview is there anything else you wish to add or change" … (*pause*) …

"Do you have any questions?" … (*pause*) …

"Thank you for that interview… (*participant name*) … you did really well"

Appendix K: Study 4 Debrief Form

THE UNIVERSITY OF WINCHESTER

Debriefing Information Form

The purpose of this research was to investigate the effects of alcohol intoxication on an individual's recall for central and peripheral details of an event, and to explore whether an Enhanced Cognitive Interview (ECI) could improve the recall of an intoxicated witness compared with a Structured Interview (SI). Although it is generally accepted amongst legal professionals that alcohol impairs memory (e.g., Kassin, Tubb, Hosch, & Memon, 2001), there is very little research that has examined this issue. In fact, in the UK only one published study has looked at the recall of an intoxicated eyewitness (La Rooy, Nicol, & Terry, 2013).

In light of the lack of research, this PHD thesis aimed to test whether the theory currently underpinning alcohol and eyewitness research – Alcohol Myopia Theory (AMT) - could account for the pattern of recall of intoxicated witnesses. AMT (Steele & Josephs, 1990) proposes that when an individual is intoxicated a disproportionate amount of attention is given to immediate central cues, whilst weaker peripheral cues receive less attention. As a consequence, researchers have anticipated that intoxicated witnesses will have poorer recall for peripheral details than a sober witness. However, previous studies within this thesis have not found the pattern of recall impairments predicted by AMT. Alcohol, however, was seen to impair recall completeness but not accuracy. The present study therefore aimed to determine whether the ECI could be used to improve the recall of intoxicated witnesses. The ECI consists of a number of interview mnemonics based upon multiple trace theory (e.g., Wickens, 1970) coupled with the encoding specificity principle (Tulving & Thomson, 1973). Multiple trace theory suggests that memory is viewed as a complex network of associations where ultimately information that is not available through one recall method may be available through another. Further to this the encoding specificity principle suggests that the effectiveness of a recall method is enhanced when the contextual information at encoding is also present at retrieval (Geiselman et al., 1985). As a result, the ECI incorporates a number of different recall methods and the mnemonics of 'report everything' and 'mental reinstatement of context', along with social facilitative techniques such as witness compatible questioning (see Milne & Bull, 1999). A Structured Interview in contrast incorporates the social facilitative techniques of the (E)CI but does not employ the 'report everything' or 'mental reinstatement of context 'mnemonics.

Research indicates the (E)CI can increase the amount of correct information recalled by approximately 35-40% compared to a standard or a structured interview (Clifford & George, 1996; Fisher, Geiselman, & Amador, 1989; Geiselman et al., 1984; Köhnken, Thürer, & Zoberbier, 1994). Although some studies have also found a small increase in the amount of incorrect information recalled with the (E)CI, this effect is neither as large nor as consistent as the increase in correct information, and is not considered sufficient to affect the overall accuracy rate (Köhnken, Milne, Memon, & Bull, 1999; Memon, Meissner, & Fraser, 2010). To date, however, research has not explored whether the (E)CI has the capacity to improve the recall of an intoxicated witness. The aim of this study was therefore to examine if, as with a sober witness, the (E)CI can aid in improving the recall of an intoxicated witness, compared to a SI. Considering the predictions of AMT, this study also explored whether the recall of specific types of information, such as surrounding details, were particularly affected by this recall technique.

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Appendix L: Study 5 Witness Testimonies

Sober Witness – Short Testimony

Interviewer

When you are ready please tell me what you remember.

Witness

A man walks into a corridor and tries to open some lockers and failed so he walked into another room where he walked round and saw a laptop on the desk. He took that laptop and put it in his bag. Then he walked to another room where I don't think he found anything and then he picked up a purse and took some money out of the purse. There was a teddy bear somewhere and then he walked back out. That's all I really remember.

Interviewer

Thank you for doing that, you have given me a lot of information, that's really great. Based on the things you've just told me I would like to ask you some more questions. As I mentioned before I'm going to use the notes I made to guide me. If you can't remember something don't make it up its fine to say I don't know. You mentioned a man, can you tell me more about what he looked like and what he was wearing?

Witness

He had dark hair. I think he was in baggy clothes, I can't remember the colour. He had a back pack on because that's what he put the laptop in but that's all I remember.

Interviewer

Can you describe the corridor for me? What did it look like?

Witness

It was quite small, narrow. The lockers were grey and quite big it looked like, well it was, it was a school corridor.

Interviewer

You said he tried to open some lockers. Is there any more information you can give me about that?

Witness

No, I just remember him trying to open the lockers. He couldn't open them so he went to another locker and couldn't open that. He tried a couple and then walked past.

Interviewer

Ok, you then said he went into another room. Can you describe that room for me? What did it look like?

Witness

It was a bit like a conference room so it had like a long table, a flat sort of desk where the laptop was.

Interviewer

In that room you said he took a laptop. Is there any more information you can tell me about that?

Witness

The laptop was silver I think. Not sure what else. That was the same room as the teddy bear I think.

Interviewer

After that you said he went into another room. Can you describe that room for me? What did it look like?

Witness

I think it had like rows of chairs. I'm not sure what else.

Interviewer

Ok, You said he took some money out of a purse in that room. Just thinking about that, is there any more information you can tell me about that?

Witness

No, I just remember him walking to a red leather bag. He just pulled the purse out of the bag and stole the money but I don't really remember.

Interviewer

Ok, just before we finish this interview is there anything you wish to add or change?

Witness

No.

Interviewer

Do you have any questions?

Witness

No

Interviewer

Thank you. Interview ended.

Moderately Intoxicated Witness - Short Testimony

Interviewer

When you are ready please tell me what you can remember.

Witness

There was a man and he entered through a door into a corridor, and he searched through all the lockers to see I suppose what he could steal. When he didn't find anything in the lockers he went through another door into a room, saw a bag and he went and got something, I think it was a purse out of the bag. He kept looking around his shoulders all of the time, making sure no one was looking at him. He was quite tall, dark hair I think he was in jeans, yeah jeans and like a jacket and then when he got the purse he left. That's all I can remember.

Interviewer

Thank you for doing that. Based on the things you've just told me, I'd like to ask you some more questions. As I mentioned before I'm going to use the notes I made to guide me. If you can't remember something don't make it up its fine to say I don't know. Ok, just thinking about the locker corridor can you describe it for me? What did it look like? What did you see?

Witness

It was just a corridor with lockers on the, the lockers were on the right of him.

Interviewer

Ok. You mentioned that he searched through all the lockers. Can you tell me anymore information about that?

Witness

No. He just entered through the door I think, did he force entry on the lockers, or was it open? I don't think I can remember, sorry.

Interviewer

Ok. You said he then went into another room. Just thinking about that room for me, can you describe it, what did it look like?

Witness

It looked like a classroom, like a whiteboard, big colourful boards on the walls. It had the table in the middle with loads of like sofas around it, and the bag was on one of the chairs.

Interviewer

You said you thought he saw a bag and got something out of it, maybe a purse. Is there any more information you can give me about that?

Witness

The purse was just rectangular it wasn't like a small one it was just a long one, just a long purse.

Interviewer
You mentioned there was a man. Can you tell me anything more about what he was wearing and what he looked like?

Witness

He was quite tall, dark hair; sort of mid to long hair just wearing jeans and a jacket. I can't really remember anything else about him

Interviewer

Just before we finish this interview is there anything you wish to add or change?

Witness

No.

Interviewer

Do you have any questions?

Witness

No

Interviewer

Thank you. Interview ended.

Severely Intoxicated Witness - Short Testimony

Interviewer

When you are ready please tell me what you can remember.

Witness

I remember a man; he was around the age of about 25. He was opening a door; he was dressed in a white t-shirt and a black leather jacket, and had dark hair. He looked around the room, and he came across something in one of the rooms I think it was a bag and he looked inside but didn't take anything or the bag. He went through to another room, found a dark bag and went through it and then took the bag and that's all I remember.

Interviewer

Thank you for doing that. Based on the things you've just told me, I'd like to ask you some more questions. As I mentioned before I'm going to use the notes I made to guide me. If you can't remember something don't make it up its fine to say I don't know. You mentioned there was a man. Can you tell me anything more about what he was wearing and what he looked like?

Witness

He had dark hair. He was wearing a black jacket and was just kind of average looking. He had a white t-shirt on. I think he had dark jeans on too, that's it, oh oh yeah he was clean shaven I think. He had no beard or stubble or anything.

Interviewer

Ok. You said he looked around a room. Just thinking about that room, Can you describe it for me? What did it look like, what did you see?

Witness

It looked like a normal classroom with like tables and chairs, windows on the right hand side of the room, I think, and there was no one else in there, just him. That's it.

Interviewer

Ok. You said he came across a bag and looked inside. Is there any more information you can give me about that?

Witness

No, not really, no. Sorry. That bit is a bit vague and I don't want to guess.

Interviewer

Ok. You said he went into another room where there was a dark bag, just thinking about that room; can you describe it for me? What did it look like?

Witness

I think there were sofas rather than you know tables and chairs in there, and there was a coffee table. I don't remember any windows in that room. That's it.

Interviewer

You mentioned he took a dark bag. Is there any more information you tell me about that?

Witness

I think he picked up some items rather than just looking at them, he touched them, lifted them out and then put them back in the bag, and then he just took the bag.

Interviewer

Just before we finish this interview is there anything you wish to add or change?

Witness

No.

Interviewer

Do you have any questions?

Witness

No

Interviewer

Thank you. Interview ended.

Sober Witness – Long Testimony

Interviewer

When you are ready please tell me what you can remember.

Witness

First thing I remember is a man, probably him picking up a laptop from a desk, unplugged it put it in his bag, had a backpack on. I remember him walking through the classrooms, nothing about the colours of rooms or anything. The laptop was actually the first room he entered, before that he walked through corridors in the school or wherever and tried opening a locker, moved along a little bit, attempted to open another one, being quite forceful opening lockers. After that that's when he went to a classroom to pick up the laptop, put it in his backpack. After that he proceeded through a couple of other rooms. I think it was a staffroom he ended up in, chairs everywhere, well seating, and there was a bag on a table, which he rummaged through, found a purse, took money from that purse, searched through it to see if anything else of value was in there. Put it back in the bag. Remember him going through a couple of drawers on the desk in one of the rooms. That's it I think

Interviewer

Thank you for doing that. Based on the things you've just told me, I'd like to ask you some more questions. As I mentioned before I'm going to use the notes I made to guide me. If you can't remember something don't make it up its fine to say I don't know. Ok, you mentioned a man. Can you tell me more about what he looked like, what he was wearing?

Witness

He had darkish hair; it wasn't black so it was more of a mousy brown. I don't really remember facial hair, wearing a hooded top, didn't have the hood up. Jeans, trainers obviously backpack. Backpack was black. His hair was fairly short as well

Interviewer

Ok. You said that the first thing you remembered was the man putting a laptop in his backpack. Can you tell me some more information about that?

Witness

Laptop was open actually; it wasn't closed on the desk. It was actually hooked up to cables, he had to unplug it to obviously put it in his backpack and take it with him, the laptop was either black or silver, that's quite vague in my memory. Not a lot else

Interviewer

Ok.

Witness

Oh, he flicked through a couple of books on the desk as well, that's it.

Interviewer

Ok, Can you describe that room for me? What did it look like?

Witness

I want to say blue walls, not bright blue, Pale blue. Tables and chairs, individual desks they weren't sort of tables where you'd sit around in groups. Monitor behind the desk from what I can remember that monitor is actually on, sort of that blue screen you have when nothing is actually connected. That's it

Interviewer

Ok, you said he was also in a locker corridor. Can you describe that corridor for me please?

Witness

Lockers were grey, it was empty didn't see anyone else walking through but he continued, he was checking around. Polished floors. Cream walls and the lockers filled, looking at it the left hand side of that wall. That's it

Interviewer

You said he tried opening up a couple of lockers. Is there any more information that you can remember about that?

Witness

He wasn't successful in opening the lockers I think that's why he continued through the school, see if there was anything else he could find.

Interviewer

You said he went then went through a couple of rooms. Can you tell me anymore about those rooms?

Witness

No, sorry I just vaguely remember him going through the rooms.

Interviewer

Ok, you then said he went into another room, more like a staffroom. Thinking about that room for me can you describe it, what did it look like?

Witness

I remember there being sort of bare floor area, not wooden but a bare floor and then a carpeted area which is where I, where the chairs were as well. I will say there was sink on one side at the back, towards the back of the room away from the grouping of chairs and small tables. Cream walls again, fairly plain. Blue chairs again not bright. That's it

Interviewer

Ok. You said he took some money from a purse. Just thinking about that is there any more information you can give me?

Witness

As he rummaged through the bag, found the purse, searched through the purse, first thing he found obviously was the money, took that and put it in his pocket, back jean pocket. Saw nothing else worth any value and put the purse back in the bag. Left the room. I'm not entirely sure if it was that room or a different room but I remember him attempting to open a filing cabinet. From what I remember he wasn't successful at doing that either.

Interviewer

Ok. Just before we finish this interview is there anything you wish to add or change?

Witness

No

Interviewer

Do you have any questions?

Witness

No

Interviewer

Thank you. Interview ended.

Moderately Intoxicated Witness – Long Testimony

Interviewer

When you are ready please tell me what you can remember.

Witness

He was wearing a white t-shirt and a black leather jacket and blue jeans and a backpack and he came into the building, into a corridor and tried to open two lockers. Then went into another room and spent a while looking around the room. He stole a silver laptop, and I think he looked at a computer in the room but didn't take it, and I think he spent a while looking around that room. Then he got into another room and saw someone's bag, I think it might have been a red bag and he took a purse out of it and took some money out of that. He put the money in his pocket and the laptop in his bag. The bag was left on a chair. Not sure what else I can remember I think that's all he took.

Interviewer

Ok

Witness

I think he left back out the same way he came in again. I think it was just the two rooms, three rooms with the lockers that he looked in. I think that was everything.

Interviewer

Thank you for doing that. Based on the things you've just told me, I'd like to ask you some more questions. As I mentioned before I'm going to use the notes I made to guide me. If you can't remember something don't make it up its fine to say I don't know. Can you describe what the man was wearing and what he looked like for me?

Witness

He was white, quite pale, dark hair possibly black if not dark brown. Light blue jeans, a white t-shirt and a black leather jacket. He had a large backpack, can't remember what colour, may be green. I think he was average shape and height. Yeah that's everything.

Interviewer

You said he started in a locker corridor. Can you describe it for me? What did it look like?

Witness

The door was at the back and then he came in and well from my point of view the lockers were on the left and they were a bluey green colour. Yeah

Interviewer

You said he tried to open some lockers. Is there anything else you can tell me about that?

Witness

No he just tried to get into two lockers I think.

Interviewer

You then said he went into a classroom**. C**an you describe the room for me, what did it look like?

Witness

Think it was table and chairs and may be two rows so that if the fronts here then there was one here and one here perhaps, with the teachers desk at the front. A U shape. With a whiteboard at the front, or an interactive white board at the front, and he came in from one side at the back and left from the other side at the back. So he sort of walked all the way round the room and left at the other exit.

Interviewer

Ok, you said he stole a silver laptop. Is there anything else you can tell me about that?

Witness

The laptop was on the other side of the room to what he came in so as he was walking to the laptop he was walking quite slowly looking at everything else around him. Sort of nosing, seeing what was about. Then eventually came across the laptop, put it in his backpack and then I think he saw a computer in the room. I think he was nosing around that for a little while and didn't take anything. I think someone had left their stuff on a table nearby and I think he went to that afterwards. Again looked around, don't think he took anything.

Interviewer

You mentioned that he went into another room. Can you describe what that room looked like for me?

Witness

I think it was, as he came in the door on his right so closest to me there were chairs laid out and over to the back of the room there was tables, or a table may be, and he walked between the tables and the chairs and left from the other side of the room so he ended up walking across.

Interviewer

Ok, you said he took some money. Can you tell me anything else about that?

Witness

I can remember him looking around a lot and just seeing what he could find. I can't remember that room as well. The handbag was on a chair, it was a big bag, and I think there may have been tables behind the chair which he walked past and again he came in one exit and out another. He went through the room.

Interviewer

Just before we finish this interview is there anything you wish to add or change?

Witness

No

Interviewer

Do you have any questions?

Witness

No

Interviewer

Thank you. Interview ended.

Severely intoxicated – Long testimony

Interviewer

When you are ready please tell me what you can remember.

Witness

So the man entered the building through a door that was automatic he looked through some lockers yeah lockers in a corridor. Sometimes there was a gap of one sometimes there was a gap of two and he didn't find anything so he went through into like a classroom and on the board it had a formula $E=MC^2$, and he was looking around for I assume something, laptops or something of value to steal but couldn't find anything. I think he went into another room to look around, he looked around a lot but again didn't find anything of use there either. But that's all I can really remember.

Interviewer

Thank you for doing that. Based on the things you've just told me, I'd like to ask you some more questions. As I mentioned before I'm going to use the notes I made to guide me. If you can't remember something don't make it up its fine to say I don't know. You mentioned a man, can you tell me more about what he looked like and what he was wearing?

Witness

He was quite a tall man, dark hair – very dark hair, had a backpack I assume to put the stuff in that he would steal. He had it on his shoulder. He had quite big broad shoulders, quite messy hair; I think that's about it. Oh, wearing jeans and a jacket, a black jacket, it was kind of like a bomber shape jacket and a t-shirt under that. I think it might have been grey.

Interviewer

You said he looked through some lockers. Thinking about that, is there any more information you can tell me?

Witness

He kind of tapped on the lockers and then tried to open them to see if there was anything inside. He wasn't going for everyone. So he kind of went for one and then skipped one or skipped two, so it might have been a pattern. I don't know what pattern but he wasn't trying every one and couldn't get in them.

Interviewer

Ok, can you describe the locker corridor for me?

Witness

The lockers were blue and the floor, the carpet on the floor was grey. There was a door on one side of the corridor, don't know where that went to. There was another door at one end

of the corridor; it was quite a big door so I think it was probably like a fire escape door or something. Yeah, yeah that's it, I can't remember anymore.

Interviewer

You mentioned he went into a room where $E=MC^2$ was on the board. Can you tell me more about that room?

Witness

He went around the room and went up to a desk to see if there was a laptop, ooh he shut the laptop to take it, to put it in his bag, his back pack.

Interviewer

Ok, is there any more information you can tell me about that?

Witness

The laptop, it was on the table, it was greyish I think and just sitting there open. He just shut it. I can't remember much else.

Interviewer

Thinking about that classroom can you describe that room for me please?

Witness

There were some tables; there was one at the front, one desk with the laptop on it. I think two tables in the middle you know pushed together and like cupboards and things either side of the room. It looked like a normal classroom so had tables, chairs, displays and that, and then obviously a main projector with the formula on it, and he just walked around the room.

Interviewer

You then said you think he went into another room. Thinking about that is there any other information you can give me?

Witness

There was a lot of seating in that area. I seem to remember a teddy bear, I don't know why there was teddy bear, I don't know if that was my imagination. I don't know if he took anything from that area but that one … that room is a bit hazy compared with the rest. Think he might have gone into a handbag yeah a bag, and taken something out of it like a purse from inside, but I'm not really sure.

Interviewer

Are there any more details you can remember about the handbag?

Witness

Not really no. As I said that bit is still a bit hazy sorry.

Interviewer

Ok, just before we finish this interview is there anything you wish to add or change?

Witness

No, I don’t think so.

Interviewer

Do you have any questions?

Witness

No

Interviewer

Thank you. Interview ended.

APPENDIX M: Study 5 Juror Questionnaire

THE UNIVERSITY OF WINCHESTER

Information and consent form

I am PhD student at the University of Winchester studying witness memory and as part of this research I am looking at how jurors perceive the recall and credibility of witnesses. I am therefore inviting you to participate in this research by completing the following questionnaire. The study has been approved by the University of Winchester and complies with the British Psychological Society's ethical guidelines and regulations.

You will be initially asked to confirm that you are eligible to take part in the study, namely that you meet the criteria necessary to serve on a jury. If you are able to take part you will be asked to provide some basic demographic information before you will be presented with the written testimony of a witness to a non-violent theft. This will be followed by some questions about the testimony. The questionnaire should take about 15-20 minutes to complete and your participation would be greatly appreciated.

Taking part in this study is entirely voluntary and measures are taken to ensure your responses are completely anonymous. You are free to withdraw at any point without any penalty, before 15th November 2016. Before you begin providing demographic information you will be asked to create a Unique Reference Number (URN). If at any point you wish to withdraw please email me with your URN number so that your responses can be identified and deleted.

At the end of the questionnaire you will be asked to provide your email address if you wish to receive a debrief form detailing the conclusions that have been drawn from the research. Your email address will be kept confidential, stored in a secure location and not disclosed to anyone. Your e-mail address will be kept separate from your responses to further ensure your anonymity.

If you have any questions about your participation in this research please e-mail me, or my supervisor (Wendy.Kneller@winchester.ac.uk). If you have ethical concerns about the questionnaire please contact me, or Maru.Mormina@winchester.ac.uk.

Thank you in advance for completing this research.

Deborah Crossland (D.Crossland.05@unimail.winchester.ac.uk)

Before you begin please make sure that:

You have read and understood this Information Sheet,

You understand your participation is entirely voluntary and you may withdraw at any point,

You are aware that your anonymity will be ensured at all times,

Your personal information will be kept in a secure location and not disclosed to anyone,

You understand you have the opportunity to discuss any study concerns with the researcher.

Please be aware that by proceeding with the questionnaire you are consenting to take part in this research. You are also confirming that you understand the above information and the arrangements made regarding your participation.

URN: …….……

Juror eligibility

Research study: How credible are witnesses?

To take part in this research study, you must be eligible for jury service in the UK. To be eligible for jury service, you must meet the criteria listed in the box below.

<u>Eligibility for jury service:</u>

You could be selected to serve on a jury in the UK if you:

- Are aged between 18 and 69 years old;
- Are registered on your local government's electoral register;
- Have lived in the UK, the Channel Isles or the Isle of Man for the last five years since you were 13 years old.

You are disqualified from jury service if:

- You lack the mental capacity to do so. Mental capacity is the ability to make a decision for yourself. People who cannot do this are said to 'lack capacity' under the Mental Capacity Act 2005. This must be due to an impairment or disturbance in the functioning of the mind or brain which may be due to illness, injury, learning disability, or mental health problems.
- To have capacity a person must be able to:
- Understand the information that is relevant to the decision they want to make.
- Retain the information long enough to be able to make the decision.
- Communicate the decision by any means.

You are disqualified from jury service if you are currently on bail in criminal proceedings.

You are also disqualified if:

- You have ever been sentenced to imprisonment for five years or more
- If you have been imprisoned at all in the last 10 years

Do you meet the criteria for serving on a jury (please tick)?

☐ Yes ☐ No

Study questionnaire

How old are you?

____ years old

What is your gender?

☐ Male

☐ Female

☐ Other (please specify):

What is you ethnicity?

☐ White British

☐ White Irish

☐ Any other White background

☐ Asian or Asian British

☐ Asian Indian

☐ Asian Pakistani

☐ Asian Bangladeshi

☐ Any other Asian background

☐ Black or Black British

☐ Black Caribbean

☐ Black African

☐ Any other Black background

☐ Mixed White and Black Caribbean

☐ Mixed White and Black African

☐ Mixed White and Asian

☐ Any other Mixed background

☐ Chinese

☐ Any other Ethnic group

☐ Prefer not to answer

What is your current employment status? (Please tick all that apply)

- ☐ Employed
- ☐ Unemployed
- ☐ Homemaker
- ☐ Student
- ☐ Retired
- ☐ Unable to work
- ☐ Prefer not to answer

Witness testimony

Below you will find the testimony of a witness. The defendant is being accused of theft and as part of the jury you have been given the recall of this witness.

Immediately prior to the alleged theft the witness had been in the University bar alone. They had been drinking lemonade and were sober at the time of the alleged crime.

Please read the following interview with this witness carefully before moving on to answer questions about the testimony.

Interviewer

When you are ready please tell me what you remember.

Witness

A man walks into a corridor and tries to open some lockers and failed so he walked into another room where he walked round and saw a laptop on the desk. He took that laptop and put it in his bag. Then he walked to another room where I don't think he found anything and then he picked up a purse and took some money out of the purse. There was a teddy bear somewhere and then he walked back out. That's all I really remember.

Interviewer

Thank you for doing that, you have given me a lot of information, that’s really great. Based on the things you've just told me I would like to ask you some more questions. As I mentioned before I'm going to use the notes I made to guide me. If you can't remember something don't make it up its fine to say I don't know. You mentioned a man, can you tell me more about what he looked like and what he was wearing?

Witness

He had dark hair. I think he was in baggy clothes, I can't remember the colour. He had a back pack on because that's what he put the laptop in but that's all I remember.

Interviewer

Can you describe the corridor for me? What did it look like?

Witness

It was quite small, narrow. The lockers were grey and quite big it looked like, well it was, it was a school corridor.

Interviewer

You said he tried to open some lockers. Is there any more information you can give me about that?

Witness

No, I just remember him trying to open the lockers. He couldn't open them so he went to another locker and couldn't open that. He tried a couple and then walked past.

Interviewer

Ok, you then said he went into another room. Can you describe that room for me? What did it look like?

Witness

It was a bit like a conference room so it had like a long table, a flat sort of desk where the laptop was.

Interviewer

In that room you said he took a laptop. Is there any more information you can tell me about that?

Witness

The laptop was silver I think. Not sure what else. That was the same room as the teddy bear I think.

Interviewer

After that you said he went into another room. Can you describe that room for me? What did it look like?

Witness

I think it had like rows of chairs. I'm not sure what else.

Interviewer

Ok, You said he took some money out of a purse in that room. Just thinking about that, is there any more information you can tell me about that?

Witness

No, I just remember him walking to a red leather bag. He just pulled the purse out of the bag and stole the money but I don't really remember.

Interviewer

Ok, just before we finish this interview is there anything you wish to add or change?

Witness

No.

Interviewer

Do you have any questions?

Witness

No

Interviewer

Thank you. Interview ended.

Questionnaire questions

1) Please circle the number that you feel best represents how <u>convincing</u> the witness appeared (1 = not at all convincing, 7 = extremely convincing)

Not at all convincing — Extremely convincing

1 2 3 4 5 6 7

2) Please circle the number that you feel best represents how <u>confident</u> the witness appeared (1 = not at all confident, 7 = extremely confident)

Not at all confident — Extremely confident

1 2 3 4 5 6 7

3) Please circle the number that you feel best represents how <u>competent</u> the witness appeared (1 = not at all competent, 7 = extremely competent)

Not at all competent — Extremely competent

1 2 3 4 5 6 7

4) Please circle the number that you feel best represents how <u>honest</u> the witness appeared (1 = not at all honest, 7 = extremely honest)

Not at all honest — Extremely honest

1 2 3 4 5 6 7

5) Please circle the number that you feel best represents how <u>believable</u> the witness appeared (1 = not at all believable, 7 = extremely believable)

Not at all believable — Extremely believable

1 2 3 4 5 6 7

6) Please circle the number you feel best represents how <u>credible</u> the witness appeared (1 = not at all credible, 7 = extremely credible)

Not at all credible						Extremely credible
1	2	3	4	5	6	7

7) Please circle the number you feel best represents how <u>consistent</u> the witness appeared (1 = not at all consistent, 7 = extremely consistent)

Not at all consistent						Extremely consistent
1	2	3	4	5	6	7

8) Please circle the number you feel best represents how <u>accurate</u> the witness' <u>overall</u> account appeared (1 = not at all accurate, 7 = extremely accurate)

Not at all accurate						Extremely accurate
1	2	3	4	5	6	7

9) Please circle the number that you feel best represents how <u>complete</u> the witness' <u>overall</u> account appeared (1 = not at all complete, 7 = extremely complete)

Not at all complete						Extremely complete
1	2	3	4	5	6	7

10) Please circle the number that you feel best represents how good this individual was as a witness <u>OVERALL</u> (1 = not at all credible, 7 = extremely credible)

Not at all credible						Extremely credible
1	2	3	4	5	6	7

OPTIONAL: If you wish, please let us know how you think the witness' **credibility** might be improved (please describe briefly and PLEASE WRITE CLEALY):

_____

_____

_____

_____

11) Please circle the number you feel best represents the witness' ability to remember details of the crime (1 = extremely poor, 7 = excellent)

Extremely poor Excellent

1 2 3 4 5 6 7

12) Please circle the number you feel best represents how likely the witness was to correctly recall the event if they were <u>sober</u> (1 = not at all likely, 7 = extremely likely)

Not at all likely Extremely likely

1 2 3 4 5 6 7

13) Please circle the number you feel best represents how likely the witness was to correctly recall the event if they were <u>moderately intoxicated</u> (1 = not at all likely, 7 = extremely likely)

Not at all likely Extremely likely

1 2 3 4 5 6 7

14) Please circle the number you feel best represents how likely the witness was to correctly recall the event if they were <u>severely intoxicated</u> (1 = not at all likely, 7 = extremely likely)

Not at all likely Extremely likely

1 2 3 4 5 6 7

Please circle the number that you feel best reflects your agreement with each of the following statements

15) 'Drinking more than one or two drinks in one evening is irresponsible' (1 = completely disagree, 7 = completely agree)

Completely disagree Completely agree

1 2 3 4 5 6 7

16) 'I always make sure there is a designated driver when I go out' (1 = completely disagree, 7 = completely agree)

Completely disagree Completely agree

1 2 3 4 5 6 7

17) 'I make bad decisions when I drink' (1 = completely disagree, 7 = completely agree)

Completely disagree						Completely agree
1	2	3	4	5	6	7

18) In a typical month, how often do you have a drink containing alcohol?

- ☐ Never
- ☐ Once a month or less
- ☐ 2 to 4 times a month
- ☐ 2 to 3 times a week
- ☐ 4 or more times a week

19) How many units of alcohol do you have on a typical day when you are drinking?

(For example: One shot of spirits (vodka, gin) = 1 unit; pint of beer = 2.3 units; glass of wine = 2.8 units; can of cider = 1.7 units; can of strong lager = 3 units)

- ☐ 1 – 2 units
- ☐ 3 – 4 units
- ☐ 5 – 6 units
- ☐ 7 – 8 units
- ☐ 9 + units

20) Have you been the victim of a theft within the last year?

- ☐ No
- ☐ Yes
- ☐ Don't know

21) Have you been a juror within the previous year?

- ☐ No
- ☐ Yes
- ☐ Don't know

22) During the crime was the witness described as being

- ☐ Sober
- ☐ Moderately intoxicated
- ☐ Severely intoxicated
- ☐ Other (please specify) ……
- ☐ Don't know

Study Debrief

The purpose of my PhD is to research the effects of alcohol intoxication on a witness' recall for high and low salience details of an event, and how jurors perceive the testimony of such individuals.

Although it is generally accepted amongst legal professionals that alcohol impairs memory (e.g., Kassin, Tubb, Hosch, & Memon, 2001), there is in fact very little research that has examined this issue (Malpass et al., 2008). To date only twelve published studies have investigated the effects of alcohol on an eyewitness' memory. This body of research preliminarily indicates that higher levels of alcohol intoxication reduce the completeness of a witness' recall but not necessarily the accuracy. In order to explain their conclusions the researchers have drawn upon the Alcohol Myopia Theory (AMT) (Steele & Josephs, 1990). This hypothesis proposes that when an individual is intoxicated a disproportionate amount of attention is given to immediate central cues, whilst weaker peripheral cues receive less attention. The AMT however has its roots in explaining the *behaviour* of intoxicated individuals rather than as an explanation of the *cognitive* functioning that is altered through alcohol. Despite this, alcohol and eyewitness research has drawn upon AMT without a comprehensive testing of the validity of using such a hypothesis in relation to eyewitness memory. This is therefore the primary purpose of this PhD – to test if the AMT explains the recall pattern of intoxicated witnesses.

With regards the study you have just completed, the aim was to look at how moderate and severe levels of witness intoxication affect a juror's perception of the witness' recall accuracy, completeness and credibility. To this end you were randomly assigned to one of three conditions where the amount of alcohol the witness had drunk was manipulated (sober, moderately or severely intoxicated). The testimonies however were the same for all three conditions, only your perception of the witness was altered. Based on previous research that has looked at juror perceptions of intoxicated witness recall (Benton, Ross, Bradshaw, Thomas & Bradshaw, 2006; Evans & Schreiber Compo, 2010; Lindsay, 1994) it is anticipated that higher levels of intoxication will result in jurors seeing the recall as being less credible. If you wish to be sent a copy of the study findings after data analysis has been completed, then please enter your email address at the bottom of the page. Thank you very much for completing this study. If you have any questions please feel free to email me at D.Crossland.05@unimail.winchester.ac.uk.

Deborah Crossland

Email address: …….

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