

# Alcohol-intoxicated witnesses to intimate partner violence

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Memory performance and perception of aggression and guilt

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**ABSTRACT**

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Alcohol affects memory and perception in many different ways. In legal contexts, this is a serious problem, as many witnesses to violent crimes are alcohol intoxicated. Although the relationship between alcohol and different forms of violence (e.g. intimate partner violence [IPV]) is well established, research is lacking regarding how intoxication affects witnesses' reports. The general aim of the present thesis was to examine how alcohol affected witnesses regarding their memory and perception of aggression and guilt in an IPV scenario. In Study I and II, participants ( $n = 87$ ) drank an alcoholic beverage (0.7 g/kg) or juice before viewing a film picturing IPV, and were interviewed 10 min after. In addition, they rated how aggressive they perceived the involved parties to be in different stages of the interaction and how guilty they perceived them to be. In Study III ( $n = 136$ ), the dose (0.8 g/kg for men; 0.75 g/kg for women) and timing of the interview were altered. Fifty percent of the intoxicated/sober participants were interviewed twice, directly after the film and then again one week later. Fifty percent were interviewed only after one week. The aim of **Study I** was to examine whether alcohol and gender affected the completeness, accuracy, and type of information in witnesses' reports. Women had a higher blood alcohol level than men at the 0.7 g/kg dose. Reports by alcohol intoxicated women were less complete than, but just as accurate as sober women's were, while intoxicated and sober men did not differ regarding completeness or accuracy. Intoxicated women reported fewer actions and a smaller amount of subjective information, but no difference was found between the groups regarding reported number of objects, thoughts/feelings and verbal information. The aim of **Study II** was to examine to what extent alcohol affected how aggressive and guilty witnesses perceived the involved parties to be. Intoxicated participants (0.7 g/kg) perceived physically aggressive behavior as less aggressive, but neutral behavior as more aggressive, than sober participants did. The intoxicated participants perceived the parties to be more equally guilty, while the sober participants attributed more guilt to the man alone. The aim of **Study III** was to examine whether alcohol (dose 0.8 g/kg for men, 0.75 g/kg for women) and time of interview affected the completeness, accuracy and type of information reported by the witnesses. Severe intoxication (BAC = 0.08 - 0.15), but not moderate (BAC 0.04-0.08), diminished report completeness but not accuracy for the witnesses who were interviewed directly after the event. All witnesses gave shorter and less accurate reports one week later, but having been interviewed directly after the event was associated with greater completeness of reports given one week later. Generally, severely intoxicated witnesses (BAC = 0.08 - 0.15) reported fewer actions and less verbal information, but just as many objects, as sober and moderately intoxicated witnesses did. Alcohol has a complex impact on perception of escalating aggression, which may be caused by its anxiety-reducing/disinhibiting effects. Intoxicated witnesses' more even distribution of guilt might be due to an increase in heuristic processing and reliance on gender stereotypes in an IPV scenario, where the man uses offensive aggression and the woman defensive aggression. In conclusion, alcohol affected witnesses' memory and perception of aggression and guilt, all of which are important aspects to consider in a legal setting. Further research should investigate higher alcohol doses and whether these results can be replicated in more naturalistic conditions.

*Keywords:* alcohol intoxication, witnesses, intimate partner violence, memory, aggression, guilt

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This thesis is based on the following three papers, referred to in the text by their Roman numerals.

- I. Hildebrand Karlén, M., Roos af Hjelmsäter, E., Fahlke, C., Granhag, P. A. & Söderpalm-Gordh, A. (2014). Alcohol intoxicated eyewitnesses' memory of intimate partner violence. *Psychology, Crime & Law*, *21*, 156–171.  
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## Sammanfattning (Swedish summary)

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Alkohol orsakar minnesstörningar såväl som perceptuella förändringar. Avseende minnesstörningar kan alkohol orsaka så kallade *black outs* där personen inte alls minns vad som hänt under tiden för alkoholpåverkan, och *grey outs* där partiell minnesförlust förekommer (White, 2003). Denna minnespåverkan orsakas av att alkohol stör inkodningen av nya minnen, vilket leder till att de inte lagras lika effektivt i långtidsminnet (Curran, 2006; Mintzer, 2007; White, 2003). Alkohol påverkar även hur sociala interaktioner uppfattas, där tvetydiga sociala interaktioner ses som mer fientliga av alkoholpåverkade personer än av nyktra personer (Ogle & Miller, 2004; se även Pedersen, Vasquez, Bartholow, Grosvenor & Truong, 2014, Subra, Muller, Begue, Bushman & Delmas, 2010). Alkohol påverkar dessutom aggressionsrespons på så sätt att en alkoholpåverkad person oftare anser att en aggressiv reaktion som respons på provokation är lämplig, jämfört med en nykter person (Taylor & Chermack, 1993).

Det är även vanligt att alkohol är involverat i våldsbrott såsom miss-handel mellan både kända och okända parter (BRÅ, 2009; Dingwall, 2006). Våld i nära relationer har väletablerade kopplingar till alkoholkonsumtion och är ett vanligt förekommande våldsbrott i Sverige såväl som internationellt (Gustafsson & Lundberg, 2004; WHO, 2010). Våld i nära relationer sker ofta i hemmet, men mellan 13-23% av fallen inträffar i offentliga miljöer (Dobash & Dobash, 1984; Greenfield, et al., 1998; Wilkinson & Hamerschlag, 2005). Dessutom rapporteras drygt 20% av det anmälda partnervåld som involverar fysiska våldshandlingar av någon annan person än offret (Tjaden & Thoennes, 2000). Trots den tydliga koppling som etablerats genom tidigare forskning mellan alkoholmiljöer och våldsbrott (bl.a. IPV), är alkoholens påverkan på ett vittnes möjlighet att minnas och uppfatta ett våldsscenario ett nästintill helt utforskat område (Caetano, Schaefer & Cunradi, 2001; Evans, Schreiber Compo & Russano, 2009).

Det övergripande syftet med avhandlingens tre studier var att bidra med kunskap om hur alkohol påverkar vittnens rapporter om våld i nära relationer. Studierna är baserade på två experimentella datainsamlingar som utfördes under våren 2012 respektive hösten 2013. Studie I och II är baserade på datainsamling I och Studie III på datainsamling II. I datainsamlingarna (datainsamling I:  $n = 87$ ; datainsamling II:  $n = 136$ ) fick 50% av deltagarna konsumera en alkoholhaltig dryck (40% vodka blandat med apelsinjuice). I datainsamling 1 var dryckens alkoholkoncentration 0.7 g/kg och beräknad för att deltagarnas promille skulle stiga till 0.7‰. I datainsamling 2 eftersträvades 0.8‰ och koncentrationen var 0.8 g/kg för män och 0.75 g/kg för kvinnor för att korrigera för olikheter i promillenivå mellan könen som framkom i datainsamling 1. Deltagarna i kontrollgrupperna konsumerade motsvarande

mängd apelsinjuice. Efter konsumtion såg deltagarna på en film som porträtterade social interaktion mellan en man och kvinna i hemmiljö där ett neutralt samtal utvecklas till gräl och sedermera till fysiskt våld. En intervju om scenariot gjordes 10 minuter efter filmens slut för samtliga deltagare i datainsamlingen. I datainsamling 2 intervjuades 50% av deltagarna två gånger, den första gången 10 minuter efter filmens slut och den andra gången en vecka senare. De resterande 50% av deltagarna blev endast intervjuade en vecka senare.

Syftet med **Studie I** var att undersöka hur alkohol påverkade en vittnesrapport om våld i nära relationer avseende omfattning, grad av korrekthet samt vilken typ av information som inkluderades i den. De fem typer av information som undersöktes var handlingar, verbal information, tankar/känslor, subjektiva uppfattningar samt objekt. Dessutom undersöktes om vittnets kön påverkade rapporterna som gavs av alkoholpåverkade och nyktra vittnen. Resultaten avseende alkoholpåverkan visade att kvinnor nådde en signifikant högre promillenivå (0.8‰; BAC=0.08) än män (0.7‰; BAC=0.07). På grund av skillnaden i promille gjordes separata analyser för män och kvinnor avseende alkoholens påverkan. Resultaten avseende rapportens omfattning visade att alkoholpåverkade kvinnor gav kortare vittnesutsagor än nyktra kvinnor. Det fanns ingen sådan påverkan av alkohol på rapportens omfattning för män. Avseende korrekthet fanns ingen påverkan av alkohol för kvinnors eller för mäns rapporter. Avseende typ av information, minskade rapporteringen av handlingar och av subjektiv information hos alkoholpåverkade kvinnor, men ingen minskning skedde i de övriga typerna av information. Framför allt var rapporterandet av objekt lika frekvent förekommande hos de alkoholpåverkade kvinnorna som hos de nyktra kvinnorna. Inga skillnader i typ av rapporterad information som en följd av alkoholpåverkan fanns för män.

Syftet med **Studie II** var att undersöka hur alkohol påverkade vittnens uppfattning om hur aggressiva mannen och kvinnan i ett IPV-scenario uppfattades och hur de fördelade skulden till att situationen slutade med fysiskt våld. I analyserna av uppfattning om aggression undersöktes hur aggressiva vittnena uppfattade mannen och kvinnan i filmens neutrala, verbalt aggressiva och fysiskt aggressiva fas. I analyserna av skuld undersöktes om alkohol och/eller kön påverkade vittnena i hur de uppfattade att skulden till situationens utfall var fördelad mellan mannen och kvinnan. Avseende fysisk aggression visade resultaten att alkoholpåverkade vittnen (både män och kvinnor) uppfattade den fysiska aggressionen som mindre allvarlig än vad nyktra vittnen gjorde. Avseende händelsens neutrala fas uppfattade dock alkoholpåverkade vittnen mannen och kvinnans beteende som mer aggressivt än vad nyktra vittnen gjorde. Ingen skillnad i uppfattning av aggression till följd av alkohol fanns avseende den verbalt aggressiva fasen. Vittnena gjorde aggressions- och skuldskattningarna separat för mannen och kvinnan, och för att analysera skuldfördelningen mellan mannen och kvinnan användes ett sammanslaget skuldmått: *skillnaden* mellan hur skyldig vittnet uppfattade

mannen respektive kvinnan. Resultaten visade att alkoholpåverkade vittnen uppfattade skillnaden i skuld som mindre än nyktra vittnen gjorde. Det innebär att även om mannen uppfattades som mest skyldig till våldet av både alkoholpåverkade och nyktra vittnen, fördelade alkoholpåverkade vittnen skulden mer jämt mellan parterna. Mannen sågs som något mindre skyldig och kvinnan som något mer skyldig av alkoholpåverkade vittnen än av nyktra vittnen. Ingen påverkan av kön eller interaktion mellan kön och alkohol fanns för uppfattning av aggression eller skuld.

Syftet med **Studie III** var att undersöka om resultaten från Studie I förändrades om dosen justerades för att män och kvinnor skulle nå 0.8‰ (BAC = 0.08). Dessutom undersöktes effekten av olika BAC-nivåer (måttlig och kraftig alkoholpåverkan), effekten av intervjutillfällen (om minnesprestationen skilde sig mellan dessa grupper vid en direkt intervju jämfört med en veckas fördröjning) samt om prestationen en vecka senare förbättras av att ha givit en direkt intervju. Resultaten visade att vid kraftig alkoholpåverkan (BAC = 0.08 - 0.15) minskade rapportens omfattning vid första intervjutillfället, oavsett om första intervjutillfället inträffade 10 minuter efter eller en vecka efter bevitnandet, jämfört med längden på rapporter från vittnen som varit måttligt alkoholpåverkade (BAC = 0.04 - 0.08) och nyktra. Rapporten var dock mer omfattande vid intervju en vecka efter bevitnandet om vittnet dessutom hade blivit intervjuat 10 minuter efter brottet (dvs. vid en repeterad intervju). Korrekthet påverkades inte av måttlig eller kraftig alkoholpåverkan vid direkt intervju, men rapportens grad av korrekthet var lägre i den fördröjda intervjun jämfört med den direkta intervjun för både alkoholpåverkade och nyktra vittnen. Att ha givit en direkt intervju var även associerat med en något högre korrekthet vid en repeterad intervju jämfört med korrekthet i fördröjd intervju för både alkoholpåverkade och nyktra vittnen. Alkohol påverkade dessutom olika typer av information olika. Generellt sett rapporterades handlingar och verbal information i mindre utsträckning av alkoholpåverkade vittnen i både direkt, fördröjd och repeterad intervju men rapporteringen av objekt påverkades inte av alkohol. Inga effekter av kön fanns för omfattning, korrekthet eller typ av information i rapporten.

Studierna **I-III** visade att alkohol i viss mån påverkade vittnens rapporter avseende omfattning och typ av rapporterad information, samt på vittnens uppfattningar om aggression och skuld. Alkoholpåverkade kvinnor (dos: 0.7 g/kg) gav kortare rapporter med mindre omnämnanden av handlingar och subjektiva uppfattningar jämfört med nyktra kvinnor. Detta resultat kan ha berott på både kvinnornas högre promillenivå jämfört med män eller på en könseffekt. Eftersom resultaten från Studie 3 (dos: 0.8 g/kg för män; 0.75 g/kg för kvinnor) visade samma mönster hos män när deras blodalkoholhalt nådde upp till samma som hos kvinnorna i Studie I, är det troligt att effekten berodde på alkohol och att det inte var en könseffekt. Att alkohol inte påverkade rapportens korrekthet, trots relativt hög BAC, går emot uppfattningar om alkoholpåverkade vittnen som finns t.ex. bland expertvittnen idag (Kassin, Tubb, Hosch & Memon, 2001). Resultaten från Studie I och III indikerar

att alkoholpåverkade vittnen berättar mindre om scenariot när de når över BAC 0.08, men ger lika korrekt information som nyktra vittnen, något som behöver utredas närmare. Den komplexa bilden av alkoholens påverkan på uppfattning om aggression i neutral jämfört med fysiskt aggressiv kontext kan förklaras av alkoholens ångstdämpande effekt. Alkoholpåverkan hos försöksdeltagare har i tidigare studier av tvetydiga sociala situationer visat sig öka hur pass fientlig de uppfattar interaktionen, medan i studier av risktagande är alkoholpåverkade deltagare mindre benägna att se en situation som farlig. Denna emotionsbundna effekt av alkohol behöver studeras vidare i en tillämpad rättspsykologisk kontext. Avseende skuld, uppfattade alkoholpåverkade vittnen att skulden var mer jämnt fördelad mellan mannen och kvinnan, jämfört med nyktra vittnen som uppfattade mannen som mer ensamt skyldig. Den mer jämna skuldfördelningen hos alkoholpåverkade vittnen berodde på att alkoholpåverkade vittnen tillskrev mannen lägre grad av skuld och kvinnan högre grad av skuld jämfört med nyktra vittnen. Denna olikhet i alkoholens påverkan på tillskrivande av skuld kan förklaras av att alkohol ökar benägenheten att använda stereotyper i sina bedömningar och att det är möjligt att alkoholpåverkade vittnen är extra känsliga för när stereotyper trotsas. Aggressionen hos mannen i IPV-scenariot stämmer överens med den traditionella manliga könsstereotypen, medan kvinnans aggression inte stämmer överens med en traditionell bild av ett kvinnligt offer för våld i nära relationer. Ett sådant stereotyp trots hos kvinnan kan ha orsakat att alkoholpåverkade vittnen till större grad än nyktra fokuserade på att kvinnans aggression brutit mot stereotypa beteenden, vilket bidrog till att hennes aggression tillskrevs större vikt i skuldbedömningen än mannens aggression. Mannens aggression var istället i linje med traditionella uppfattningar om stereotypt manligt beteende och kan därför ha accepterats i större grad av alkoholpåverkade vittnen än nyktra vittnen. En sådan förklaring har omfattande stöd från forskning på alkohol och bedömningar såväl som vittnen och stereotypa beteenden, men måste utredas vidare i framtida studier.

Sammanfattningsvis visar de tre studierna att alkohol endast påverkar vissa aspekter av vittnesmål om våld i nära relationer. Vid måttlig alkoholpåverkan (BAC = 0.08-0.15), rapporterar dessa vittnen en mindre mängd information, framför allt mindre information om de handlingar som partnerna utfört, jämfört med nyktra vittnen. Sanningshalten i den rapporterade informationen minskas dock inte av alkohol i dessa doser. Alkohol hade även en viss påverkan på hur vittnen bedömde grad av aggressivitet och fördelade skuldbördan mellan partnerna. Dessa resultat, både avseende alkoholens påverkan på personers förmåga att minnas våld i nära relationer och på deras bedömning av aggression och skuld, är viktiga aspekter för såväl rättssystemet som hälsovården att beakta. Vidare forskning med utgångspunkt i dessa resultat behövs för att kunna anpassa rättssystemets och vårdens hantering av dylika ärenden.

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*What is drinking but a mere pause from thinking?*

*Jonathan Swift (1667-1745)*

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# Alcohol and memory

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It happened at 11 PM last Saturday. Alice was at a party in Lisa and Leo's apartment during which all guests had had a few drinks. Suddenly she heard angry shouting from the kitchen. She went in and saw Leo and Lisa arguing and pushing each other around. She did not interfere, since she knew that Leo and Lisa could get very angry at each other. This was not out of the ordinary for them, and they usually worked things out pretty quickly. This time, however, she saw Leo grab Lisa's shoulders, forcing her down on the floor and then she saw Leo hit Lisa in the face.

Will the alcohol intoxicated eyewitness, Alice, perceive and remember this incident in the same way she would have had she been sober?

## Alcohol and intimate partner violence

Alcohol is one of the oldest drugs known to mankind. Since ca. 10,000 B.C., humans have produced and consumed alcohol, developing it significantly during Greek, Sumerian and Roman antiquity (Cavalieri, McGovern, Hartl, Mortimer & Polsinelli, 2003; Gatley, 2009; McGovern, 2003). Furthermore, alcohol has been viewed as a basic human life necessity, hailed by Hippocrates among others as beneficial to health when consumed in moderation (Vallee, 1998). According to the Greek playwright Euripides (ca 480-406 f.kr.) who wrote about its joys and sorrows in *The Bakchai*, wine was thought to be just as important as bread (Euripides, trans. 2009). It has been called *uisge beatha* and *aqua vitae*, the water of life, and has been used for medicinal as well as recreational purposes. Alcohol is celebrated for its invigorating, relaxing and anxiety dampening properties – “it alleviates the grief of humans when the wine’s life blood exalts them and gives them sleep, blessed oblivion of evils that infests the day: there is no other balm for utter weariness” (Euripides, trans. 2009). However, it is simultaneously also widely acknowledged that when alcohol is drunk in excess, it induces profound negative changes in thought, mood and character, so aversive that Cassio in Shakespeare’s *Othello* curses its negative effects on thought and behavior with the following phrase: “O thou invisible spirit of wine, if thou hast no name to be known by, let us call thee devil!” (Shakespeare, trans. 1923). Moving further back in history, Plato cautions especially young people to avoid alcohol because “fire must not be poured upon fire” and because “as drinking proceeds, every man becomes light-headed and fancies he can rule the whole world (Plato, trans. 2013). According to Euripides (trans. 2009), and the remaining accounts describing the ancient cult of Dionysos, alcohol intoxication could make moral persons violate social norms of good conduct and incline them toward hostility and violence.

Current research confirms this darker side of alcohol. According to the National Council on Alcohol and Drug Dependence (NCADD, 2016), alcohol is a factor in generally 40% of all violent crimes today. The NCADD (2016) reports that, in the USA, 31% of reported victimizations perpetrated by strangers are alcohol-related, while approx. 75% of victims who were attacked by an intimate partner reported that alcohol had been involved. Statistical figures on the alcohol-violence relationship from Great Britain and

Sweden correlate with these. According to statistics from the British Medical Association (1995, cited in Dingwall, 2006), alcohol use is associated with 60-70% of homicides, 70% of beatings and 50% of fights or assaults in the home. A recent Swedish survey showed that perpetrators of reported violent crimes were alcohol intoxicated in 62% of beatings, 52% of threats and robberies and 55% of sexual assaults (BRÅ, 2015). Regarding involvement of alcohol in IPV cases (defined as violence perpetrated by current or former spouses, boyfriends and girlfriends), The United States Department of Justice (cited in Dingwall, 2006) has reported that 67% of victims of IPV perceived that the perpetrator was under the influence of alcohol or drugs during their victimization. Furthermore, statistics from the FBI's National Incident-Based Reporting (Bureau of Justice Statistics, 2008) system showed that approx. 50% of the incidents of violence, where it was reported that the offender had been drinking prior to the offence, involved IPV victims (Dingwall, 2006). According to an archival study of police files, alcohol is involved in the majority of cases of (non-sexual) assaults (Yuille & Tollestrup, 1990). Alcohol is therefore considered to be closely associated with outbreaks of different types of interpersonal violence, among others, intimate partner violence and dating violence (Caetano et al., 2001; Foran & O'Leary, 2008; Kaufman Kantor & Straus, 1989; Shorey, Stuart & Cornelius, 2011; Wilt & Olson, 1996).

Intimate partner violence (IPV) is defined as physical, sexual and/or psychological harm perpetrated by a current or former partner or spouse (SOU 2006:65; WHO, 2010). IPV is considered to be a major public health problem and in the USA, and it is women aged 16-24 who experience the highest per capita rate of IPV (Tjaden & Thoennes, 2000). However, the cases are generally given a low priority by the police, as they are notoriously hard to process within the legal system. Often, this difficulty is due to the fact that the involved parties and witnesses were intoxicated during the event (BRÅ, 2009; Gustafsson & Lundberg, 2004). IPV often happens during weekends and holidays, which also increases the probability of alcohol being a catalyst for the violent behavior (BRÅ, 2009). Furthermore, occurrence of IPV outside the victim's/offender's residence is not uncommon (estimated to between 13-23%, Dobash & Dobash, 1984; Greenfield et al., 1998; Wilkinson & Hamerschlag, 2005), where the probability of it being observed by other adults is much higher. However, common locations for IPV to be ob-

served by other adults outside the parties' residence on weekends/holidays are in bars and at house parties, where the adult witnesses often are intoxicated (Dawson & Gartner, 1998; Balvig & Kyvsgaard, 2006; Gustafsson & Lundberg, 2004). A report from the US Department of Justice showed that adult eyewitnesses were present in approx. 22% of instances of IPV that were reported to the police, and that if a witness was present, the report more often led to a conviction (Tjaden & Thoennes, 2000; Truman & Morgan, 2014). A recent field study among police officers in the USA showed both that intoxicated witnesses were common in violent crimes, and that witnesses were often (approx. 50%) interviewed while still intoxicated (Evans, Schreiber Compo & Russano, 2009). Moreover, professionals and laypersons alike reported believing that intoxicated witnesses are less capable of giving accurate witness reports (Evans & Schreiber Compo, 2010; Kassin et al., 2001; Zajac, Dickson, Munn & O'Neill, 2013).

To my knowledge, few previous studies have looked at how alcohol affects witnesses' memory and perceptions of a violent interaction, and no previous study has investigated this in an IPV context (or in relation to any other extended interpersonal interaction escalating into physical violence). Therefore, the focus of the present thesis was on investigating different aspects of how alcohol affects witnesses' ability to perceive and recall IPV. The introduction to the three studies in the present thesis is structured as follows: Because recall of a witnessed situation is primarily dependent on the event being encoded into memory, an overview of how alcohol affects memory encoding is presented first. Second, different conceptualizations (models) of memory are presented with an emphasis on trace theory and the theory of quantity-accuracy trade-off, and their contribution to our understanding of how alcohol affects memory is discussed. Third, applied research on memory performance and intoxicated witnesses to violent crimes is presented, followed by a summary of research on the impact of time and gender on memory. Finally, research on perception of aggression and guilt and a theoretical framework of information processing is presented, taking potential effects of alcohol and emotion into account.

## Memory and alcohol

*“If recreational drugs were tools, alcohol would be a sledgehammer.”*

White, 2003

As the citation indicates, alcohol has a broad impact on cognition. It affects many, if not all, cognitive functions, impairing perception, attention, balance, motor coordination and decision-making and produces memory impairments beginning after just one or two drinks (White, 2003). Because memory is a complex cognitive function – relying on sensory perception, maintained attention, association, memory storage and retrieval operations – it is easy to conclude that alcohol affects it in several stages. However, the principal memory system relevant to eyewitness research is episodic memory. According to Conway (2008), episodic memory is a system that contains experience-near, highly event-specific, sensory-perceptual details of experiences that lasted for comparatively short periods of time (minutes or hours). It is also within the episodic memory system where most memory impairing drugs exert their major effects (Curran, 2006). Conway’s definition of episodic memory was used in the present thesis, because the primary focus of the thesis was the memory of alcohol intoxicated witnesses for an event that lasted approx. 10 mins. Alcohol’s functional effects on cognition in such circumstances, as well as theoretical constructs frequently used in episodic memory research, will be presented below. However, because alcohol naturally has a profound impact on brain neurochemistry, it was considered important to initially give an overview of how episodic memory processes are affected by alcohol intoxication on a neuropsychological level.

### Neuropsychological effects of alcohol on episodic memory

The principal brain regions implicated in episodic memory processes are the prefrontal cortex and medial temporal lobes, particularly the hippocampus (Fletcher & Henson, 2001; Simons & Spiers, 2003). The neurochemical influence of alcohol is exerted through the gamma-aminobutyric acid (GABA) system and the glutamate system (Curran, 2006), both of which strongly influence prefrontal and mediotemporal structures. Alcohol’s neurochemical impact on these cortical areas disrupts the formation of new epi-

sodic memories, as well as attempted recall processes during an intoxicated state (Curran, 2006; Pihl, Paylan, Gentes-Hawn & Hoaken, 2003; White, 2003). The degree of impairment correlates positively with blood alcohol level (Mintzer, 2007; Curran, 2006). The prefrontal and mediotemporal lobes control behavioral inhibition and organization (e.g., “executive functioning,” Baddeley, 2008), affect goal-directed cognitive functions that support the encoding of distinct memory traces, and the subsequent strategic search, retrieval and evaluation of stored representations (e.g., source memory) (Birnbaum, Parker, Hartley & Noble, 1978; Field, Wiers, Christiansen, Fillmore & Verster, 2010; Fletcher & Henson, 2001; Simons & Spiers, 2003). Research has shown that impaired prefrontal functions (e.g., during alcohol intoxication) result in disinhibited, impulsive and disorganized behavior (Peterson, Rothfleisch, Zelazo & Pihl, 1990; Pihl et al., 2003; Pihl & Sutton, 2009). In sum, the above-cited research has shown that memory encoding and recall involving complex, effortful cognitive processes are impaired by alcohol’s effects on these cortical areas.

To understand how much impact alcohol will have on cognitive processes, it is crucial to consider both the administered dose of alcohol and the degree of intoxication. First, however, one must understand the terms used to express the measurements, and earlier research has used a variety of terms. Dose has typically been reported using the administered amount of pure ethanol (i.e., alcohol) in relation to participant weight (oz/lb, ml/kg or g/kg). Degree of intoxication has usually been measured using a Breathalyzer and reported in BrAC/BAC (i.e., breath alcohol concentration/blood alcohol concentration) or BAL (i.e., blood alcohol level). Detrimental effects of alcohol on free recall memory have been shown for neutral verbal and visual material at alcohol doses as low as 0.5 g/kg (Birnbaum & Parker, 1977). A common dose used in previous studies on alcohol intoxicated eye witnesses’ recall has been 0.7 g/kg (resulting in BAC-levels  $\approx$  0.06-0.08), which for a person weighing 70 kg approximately equals four glasses of wine (à 150 ml), four beers (5% à 33 cl) or four 40% spirit shots (à 4 cl). Previous studies have shown that lower doses such as 0.4g/kg did not affect free recall of video stimuli depicting a violent event (Hagsand, Roos af Hjelmsäter, Granhag, Fahlke & Söderpalm Gordh, 2013). However, doses between 0.66g/kg-0.8 g/kg (or above) have been shown to have negative effects on recall (Gustafson, 1991; Knowles, 2005; Weissenborn & Duka, 2000; 2003). As can be

expected, higher doses, which generated BAC-levels  $> 0.1$ , have resulted in more extensive cognitive impairment (Peterson et al., 1990; Van Oorsouw & Merckelbach, 2012).

Today, doses higher than those presented above are difficult to study experimentally, both for ethical reasons and because participants become too intoxicated to follow instructions. Hence, naturalistic studies (e.g., Van Oorsouw & Merckelbach, 2012) are currently the only option when trying to capture the effects of very severe intoxication on cognition. However, in the 1970s, the impact of very high doses on memory was tested experimentally on 10 participants by Goodwin, Othmer, Halikas and Freemon (1970). They administered a very high alcohol dose (2-4g/kg; the dose varied between the participants) to test the effect of alcohol on what they defined as: *immediate memory* (2 min between stimulus and recall); *short-term memory* (30 min between stimulus and recall); *remote memory* (questions posed during intoxication about upbringing and events during the previous two days); and *long-term memory recall and recognition* (24 hours later). In addition, the study investigated the importance of the emotional valence of stimulus material for memory encoding in an intoxicated state (neutral and erotic material were tested). The results showed that the participants, who did not recall neutral items or scenes from an erotic movie 30 min after having viewed them, did not recall them 24 hours later. However, their memory during immediate testing (2 min after viewing the stimulus), as well as remote memory, was intact. This means that, regardless of the emotional valence of the stimuli, the participants were paying attention and could hold on to the information long enough to satisfy the study's criteria for "immediate memory", but that the consolidation process needed for recall after a minimum of 30 min had been disturbed by the alcohol consumption. Other research has confirmed this, showing that working memory in persons who have drunk several units of alcohol can be intact (Curran, 2006; White, 2003). This enables them to engage in a sensible conversation, even though the content of the conversation is forgotten a few minutes later (Curran, 2006). In these instances, the information can be held in temporary storage for a while. However, it will not be transferred to long-term memory (or not be encoded distinctively enough to be recalled later) due to disruption of the glutamate system, which disturbs hippocampal activity (Curran, 2006; White, 2003). This transference is necessary to be able to, for example, recall events after a few minutes (10 min

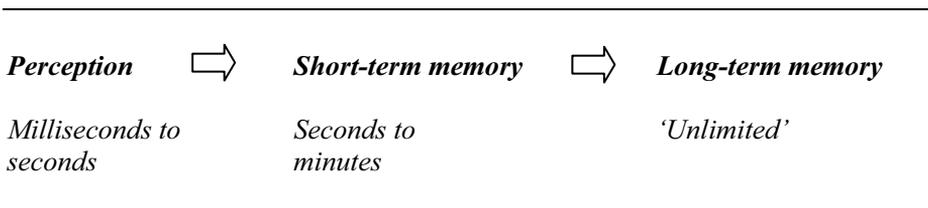
seems to be enough) of distracting tasks. Given the positive correlation between alcohol dose and cognitive impairment (Curran, 2006; White, 2003), the kind of cognitive impairments found by Goodwin et al., (1970) may be expected for lower alcohol doses as well, but to a lesser degree.

Studies on the effects of alcohol on basic cognitive functions are of vital importance to establishing causal connections between intoxication and witnesses' recall performance. However, the results from the basic alcohol research presented above need to be summarized and placed in a theoretical framework, and to be confirmed in an applied context to account for the special circumstances of interpersonal violence/intimate partner violence. Before presenting studies from an applied setting, theoretical models of memory that are relevant to intoxicated witnesses will be presented.

## Models of memory

Generally speaking, two types of memory models (or rather basic perspectives on memory) have been proposed to account for the effects of alcohol on memory: a structural model (Atkinson & Shiffrin, 1968; Baddeley & Hitch, 1974) and a process-oriented model ( Craik & Lockhart, 1972). The structural model (see *Figure 1*) separates memory into several subsystems based on length of retention interval (short-term/long-term memory), and on the type of information the subsystem handles (phonological, visuo-spatial, procedural). In the classical model proposed by Atkinson and Shiffrin (1968), short-term memory can hold a limited amount of information (traditionally viewed as 5-7 units, Miller, 1956) for a short amount of time. The long-term memory is “unlimited,” with respect to both how much information it contains and how long the information can be stored.

*Figure 1. Stages in encoding new information for long-term storage according to Atkinson and Shiffrin (1968)*



According to this model, alcohol would exert its primary effects on memory during the transferring of information from short-term memory into long-term memory. Although research has shown that information can be retained long enough to carry on a conversation during intoxication (i.e., some form of perceptual and short memory capacities are intact), it has also shown that the information cannot be recalled later if it is not encoded into long-term memory (Curran, 2006; Goodwin et al., 1970). White (2003) proposed a revised version of this model, where the concept of short-term memory has been replaced by working memory.

Craik and Lockhart (1972) proposed another model with a different basic perspective on memory. They suggested that a model based on processes, instead of retention time limit, would better account for the functions in memory recall (see *Table 1*).

*Table 1. A simplified example of a process (here: number of associations made to the incoming stimuli) on different depth-levels of encoding, according to Craik and Lockhart*

<b>Depth of encoding</b>	<b>Number of associations made to stimulus-scenario</b>	<b>Amount of recall</b>
Shallow encoding	2	Small
Medium encoding	8	Medium
Deep encoding	16	Large

The assumption underlying the model is that deeper, more comprehensive and meaningful processing of incoming information will result in better recall performance. In other words, the quality of recall depends on the degree of focused attention during encoding, and on how rich the associative network connected to the incoming information was. It does not principally depend on how long the event was studied, as proposed in the structural model, although there is a natural correlation between the two (i.e., more time gives more opportunity to focus and associate). The most serious problem with applying this process-oriented model is that a definition of “deep” has yet to be articulated (Baddeley 1978; Craik, 2002). Without a clear definition,

critics have argued that the risk of using tautological explanations of depth increases (Lockhart & Craik, 1990). Therefore, to ensure the quality of scientific investigations, an index of depth has been called for (Baddeley, 1978). However, according to Craik (2002), developing such an index is the goal of studying processes as a basis for recall, not the starting point. Despite the lack of a clear definition of depth, the benefits of the process model in alcohol/memory research have been argued to outweigh those of the structural model proposed by Atkinson and Shiffrin (see Knowles, 2005).

The process model is especially appropriate when studying the effects of alcohol intoxication on memory, as it includes both attention and ability to associate. There is a general consensus that the most comprehensive effects of intoxication on memory are exerted during the encoding phase (Birnbaum et al., 1978; Curran, 2006; Knowles, 2005; Mintzer, 2007; White, 2003). Based on this, the reduced memory performance found in alcohol/memory research has been attributed to a decreased ability to maintain attention to the stimuli (see alcohol myopia theory, Steele & Josephs, 1988; Steele & Josephs, 1990). Also, the ability to associate incoming information with previously stored memories has been shown to decrease during alcohol intoxication (Sayette, 1993; Sher, Bartholow, Peuser, Erickson & Wood, 2007).

The negative effect of alcohol on depth of processing has been demonstrated since the 1970s. In these studies, alcohol inhibited elaborative processing during encoding of word lists and, as a consequence, reduced the quantity of recalled items (Birnbaum et al., 1978; Craik, 1977; Hashtroudi, Parker, de Lisi, Wyatt, & Mutter, 1984; Knowles, 2005). The same impairing effect on quantity of recall is seen in research on episodic memory for criminal events (Hagsand et al., 2013; Yuille & Tollestrup, 1990). Together, with regard to researching alcohol intoxicated eyewitnesses' recall, these results emphasize the importance of working from the perspective of information and memory *processing*, and not only consider the results from a structural perspective. This line of applied research will be presented later in this section.

### *Alcohol and trace theory*

The main consequence of alcohol intoxication on memory is impairment of episodic memory formation (Curran, 2006). According to trace theory, moderate to high alcohol doses impairs general episodic memory capa-

city by disturbing the ability to consolidate memory traces, and this effect is closely related to problems with maintaining attention (Birnbbaum et al., 1978; Knowles, 2005). This effect of attention has also been shown in dual-task paradigms, where memory capacity is reduced (Craik, 1977; Craik 1982). These studies have shown that acute intoxication impairs attention allocation in the same manner as aging and diverted attention do (i.e., when the cognitive capacities available for the memory task are limited) (Craik, 1977; Steele & Josephs, 1988; Steele & Josephs, 1990). The claim that alcohol mainly disrupts attention and cognitive processes during encoding and not at recall has been supported by research showing that giving retrieval cues to participants who were intoxicated at the time of encoding does not aid recall (Birnbbaum et al., 1978; Curran, 2006; Ryback, 1971; Ryback, 1977). Hence, it is rather improbable that the disturbing effects of alcohol on memory primarily reflect difficulties with information retrieval (i.e., during the recall phase). Instead, these results imply that the information to be recalled has not been encoded sufficiently and/or distinctively enough to form a useful memory trace (White, 2003; Ryback, 1971; Ryback, 1977). These results are also compatible with the assumption that there is increased cognitive load during intoxication. Studies have shown that alcohol slowed down the speed of information processing and disabled some of the available cognitive resources (e.g., ability to associate and reason in a discursive manner) (Craik, 1977; Sayette, 1993)

### *Alcohol and quantity-accuracy trade-off*

According to Curran (2006, s. 82), “our accuracy in remembering depends on how well (or deeply) we process and encode details of the relevant events at the time they occur.” Curran concluded that this function is generally impaired under the influence of alcohol. However, the accuracy of recall also depends on the circumstances in which recall is attempted, with free recall of a limited amount of information being more difficult than recognition of previously observed information (Curran, 2006). Curran also notes that when participants can direct their free recall as they wish, they may – even after a few alcoholic drinks – deliver accurate reports. Curran’s explanation for this is that they report the details of the event they found particularly interesting and processed deeply and refrain from reporting other events that they remember vaguely or have forgotten entirely (Curran, 2006).

This pattern of selective reporting in a free recall interview format has been studied in non-intoxicated participants (Koriat & Goldsmith, 1996; Koriat, Goldsmith & Pansky, 2000). Koriat and Goldsmith proposed that, during free recall, a person may strive to report either as much information as possible (focus on quantity) or only information that they believe with certainty to be correct (focus on accuracy). With higher demands of accuracy, less information will be deemed accurate enough to report. In other words, if a person strives for high accuracy, it is less probable that a vaguely remembered piece of the recalled material will be reported, which will result in a less complete report. However, the accuracy *rate* (i.e., percentage correct information) of such a report would remain the same as in a report by a person who is very certain of all his/her recollections and gives a more complete report. The choice of either reporting all information one can possibly remember and accepting the increased possibility of reporting uncertain/inaccurate information or reporting only information one is absolutely sure of and accepting that the report will be shorter is called the *quantity-accuracy trade-off* (Koriat et al., 2000). However, in previous studies of the quantity-accuracy trade-off and its relationship to memory performance under high cognitive load, accuracy has been consistently favored over quantity (Koriat & Goldsmith, 1996; Koriat et al., 2000). The quantity-accuracy trade-off has also figured in previous studies looking at the patterns and function in sober witnesses' memory performance when they (during performance of a memory task) were subjected to high cognitive load (Koriat et al., 2000; see also Flowe, Takarangi, Humphries & Wright, 2015; Memon, Meissner, & Fraser, 2010).

The theoretical assumptions underlying this trade-off have been confirmed and nuanced by the distinction, revealed in fuzzy-trace theory, between two types of retrieval: direct access to verbatim traces and reconstructive processing of gist traces (Brainerd, Wright, Reyna & Payne, 2002). According to fuzzy-trace theory, free recall favors the direct access retrieval mode, which gives direct access to distinct traces of target representations. The direct access retrieval mode is most frequently used at the beginning of a free recall report. During this type of report, "participants recall the targets by merely reading out surface information as it echoes in the mind's ear or flashes in the mind's eye, much as an actor would recite words as they are whispered by a prompter or seen on a script" (Brainerd et al., 2002, pp. 121). This direct access produces fast, confident, virtually errorless recall. Ho-

wever, as recall proceeds, gist-based retrieval operation starts to occur more often. This operation is less fast and less accurate, because it reconstructs information by processing gist traces based on meaning (Brainerd et al., 2002). Presumably, a person focused on delivering an accurate report and sacrificing quantity will almost exclusively report information obtained through the direct access retrieval mode (i.e., not elaborate it beyond the “mode of certainty”). On the contrary, a person focused on quantity and sacrificing accuracy will continue to report information obtained through gist-based retrieval operations, which would result in a more comprehensive report.

## How alcohol affects free recall of a violent event

Basic experimental research on alcohol’s effects on memory and information processing is vital if we are to form hypotheses about how alcohol may affect witnesses’ memory for violent interpersonal events. However, the results of basic research need to be replicated outside a laboratory setting before we can determine whether the effects found generalize to real-world scenarios. Many basic research studies have used word-learning tasks to investigate the effect of intoxication on the completeness and accuracy of memory encoding (e.g., Birnbaum et al., 1978; Hashtroudi et al., 1984; Maylor, Rabbitt & Kingstone, 1987). Such tasks are very different from viewing a violent event (in reality or on film), first of all because the information that the person is asked to remember in the basic research on memory lacks a meaningful structure. Second, such information is not in itself stressful, and distress is a highly plausible reaction to witnessing a violent crime (or any other anxiety-provoking stimuli). Both level of meaningfulness and level of arousal/stress are factors known to influence memory performance (Hasher & Zacks, 1979; LaBar & Cabeza, 2006). The beneficial effect on memory performance of the stimuli having a meaningful structure was presented earlier in the introduction (see Craik, 2002). Regarding the impact of arousal level, Knowles (2005) showed that it has a beneficial effect on recall, regardless of whether the information has a positive or negative valence. Thus, regarding cases of IPV, the special circumstance of *witnessing violence* during intoxication (i.e., the effect of alcohol on perception, including attention and sensory distortion in this specific, potentially anxiety-provoking, situation) must be taken into consideration.

### *Interviewing intoxicated witnesses*

A relevant practical problem regarding intoxicated witnesses' memory and perception is whether they can deliver comprehensive and reliable statements concerning a meaningful and, in most cases, stressful, violent scenario during a police interview. To the best of my knowledge, only six studies have been conducted on alcohol intoxicated witnesses' free recall of a criminal (and/or aggressive) event. These six studies have reported different results with respect to alcohol's effect on the completeness and accuracy of witnesses' reports.

The first study conducted on intoxicated witnesses examined intoxicated men's free recall (both directly and after a one-week delay) of a staged verbally aggressive interaction, which ended in theft (Yuille & Tollestrup, 1990). The results showed that alcohol intoxication reduced the completeness, but not the accuracy of the report in the direct interview. Compared to the witnesses who were interviewed directly, all witnesses (i.e., in both the sober and intoxicated group) in the one-week delay interview condition reported less information. Furthermore, the accuracy rate of the report was also somewhat reduced for alcohol intoxicated witnesses in the delayed interview condition (87.4% accuracy) compared to the direct interview condition (90.8%), but not for sober witnesses (direct: 92.5%; delayed: 90.9%). The study also showed that the witnesses who had been interviewed directly after the event reported more information (intoxicated: 25.0%; sober: 27.9%) in a second interview held one week later, compared to the witnesses who gave their first interview one week after the event. The accuracy rate of the report one week later was not affected by having given an interview directly after the event.

The second study was a field study set in a bar where witnesses' memory of a film picturing a theft was investigated 3-5 days later using written free recall followed by written cued recall (Van Oorsouw & Merckelbach, 2012). The results showed that alcohol intoxication reduced the completeness of the report in both free and cued recall. The accuracy rate of the free recall was not significantly different between intoxicated and sober witnesses, but a downward trend can be seen with increasing intoxication levels (accuracy rate: sober: 91%; moderately intoxicated, BAC 0.06: 89%; severely intoxicated, BAC 0.17: 81%). However, it should be noted that the measure called free recall in this second study was obtained by investigating how

many of 36 critical details the participants mentioned in their free recall, and therefore did not include how many other details the witnesses reported about the film. Furthermore, the participants in the study were asked to identify with the perpetrator in the film, and the results could therefore be considered to capture memory performance from a perpetrator's point of view, rather than that of a third-party witness.

The third study was set in a "laboratory bar," in which participants witnessed a staged live theft of a computer (Schreiber Compo et al., 2012). The results showed no effect of alcohol intoxication (BrAC: 0.06-0.08, approx. equivalent to a dose of 0.7 g/kg) on either the completeness or accuracy of the reports.

The fourth study found that alcohol intoxication (low dose 0.2g/kg and high dose 0.6g/kg) did not affect the completeness or accuracy of reports made by witnesses to an unsuccessful robbery when interviewed directly after the event (during intoxication) or when interviewed again 24 hours later (when sober). A reminiscence effect was found, which showed that all participants reported more, and accurate, information during the second interview (La Rooy, Nicol & Terry, 2013).

The fifth study showed that intoxication (dose 0.7 g/kg, mean BAC = 0.06) reduced the completeness of the reports when witnesses were interviewed after a one-week delay (Hagsand et al., 2013). In the sixth study, intoxication reduced the completeness of the free recall part of the report, both in the direct interview condition and after a one-week delay, and no effect of alcohol was found on the accuracy rate in free recall (Hagsand et al., 2015). Furthermore, all witnesses (regardless of intoxication during the event) recalled more details and were more accurate in free recall compared to cued recall; they also reported more details in the direct interview compared to the delayed interview. This sixth study also showed that witnesses who had given a direct interview reported more units of unique information over the two interviews combined and had a higher total accuracy rate compared to witnesses who gave their first interview one week after the event (Hagsand et al., 2015).

These somewhat mixed results might be explained by the fact that the studies were rather different in design. One source of variation is the stimulus material used. For example, Schreiber Compo et al., (2012) used a non-violent live staged theft, whereas Yuille and Tollestrup (1990) used a ver-

bally aggressive, but non-violent, interaction during a staged theft. Hagsand et al. (2013, 2015) used a moderately aggressive and violent interaction (a kidnapping) viewed on video. Another source of variation is the difference in consumed amount of alcohol, which resulted in BAC levels ranging from 0.04 (Hagsand et al., 2013) to 0.25 (Van Oorsouw & Merckelbach, 2012). The third source of variation is the mode of interview, which consisted of either written questions/answers (Van Oorsouw & Merckelbach, 2012) or an oral interview (Hagsand et al., 2013, 2015; Schreiber Compo et al., 2012; Yuille & Tollestrup, 1990). The fourth source of variation is the rate of consumption, i.e. how fast the alcoholic drinks were consumed. Hagsand et al., (2013) used a consumption time of 15 min, whereas the studies by Schreiber Compo et al., (2012) and Yuille and Tollestrup (1990) used 30 min. The consumption time in the study by Van Oorsouw and Merckelbach (2012) was several hours. Both dose and pace of consumption are important when investigating recall, as a higher dose of alcohol and a quicker pace of consumption will both increase the risk of impairment in memory recall (Curran, 2006; White, 2003). Two other important sources of variation are participant gender and time of interview. For example, a delayed interview has resulted in a decreased amount of information reported (Hagsand et al., 2015), as well as decreased completeness and a slight decrease in accuracy (Yuille & Tollestrup, 1990) for all witnesses. The aspect of time in relation to alcohol intoxication will be presented more comprehensively in the next section. Regarding gender, the study by Yuille and Tollestrup (1990) only included men, while other studies have had a majority of female participants (Schreiber Compo et al., 2012; Hagsand et al., 2013). Gender is an important variable in the context of the present thesis, both because IPV is a crime type closely associated with traditional gender roles and because research on gender differences in memory performance has shown ambiguous results. The impact of gender on memory performance will be discussed in the next section, together with the effect of intoxication during encoding in direct and delayed interview conditions (here: one week after witnessing the event).

Table 2. Overview of previous studies on intoxicated witnesses' recall using measures of completeness and accuracy

Authors	Dose/ BAC Consumption time	Interview characteristics	Setting/ crime	Effect of alcohol/ time/ interview format on: Completeness	Effect of alcohol/ time/ interview format on: Accuracy
Yuille & Tollestrup, 1990	1.0g/kg BAC: 0.1 30 min	Oral free recall; Direct + one-week delay + repeated condition	Laboratory/ live theft and verbal aggression	Alcohol: Negative effect Time: Negative effect Repetition: Positive effect	Alcohol: Small effect Time: Negative effect Repetition: No effect
Van Oorsouw & Merckelbach, 2012	Dose: highly dissimilar BAC: 0.06/0.17	Written free recall 3-5 days later by e-mail; Central/peripheral details checked	Bar (field study)/ filmed burglary/ Asked to identify with the perpetrator	Alcohol: Negative effect Central details: fewer correct central details (moderate and severe intoxication) ( $\eta^2=0.34$ / $d=>1.38$ ). Peripheral: only fewer among severely intoxicated persons, $d=0.77$	Alcohol: No effect on accuracy in free recall. Both intoxicated and sober were more accurate in recall of central details compared to peripheral details ( $\eta^2=0.27$ )
Schreiber Compo et al., 2012	Dose: 0.7g/kg BAC: 0.06-0.08 30 min	Oral, open questions recall; Interviewed directly after the event	Laboratory bar; live theft	Alcohol: No effect; Interview format: no effect of alcohol regardless of format ( $\eta^2=0.01$ )	Alcohol: No effect ( $\eta^2=0.02$ ) Interview format: Alcohol in cued recall generated more false answers ( $\eta^2=0.13$ )
La Rooy et al., 2013	Dose: 0.6g/kg BAC: not reported; BrAC 32.4g/100ml in high dose 15 min	Laboratory; Direct + Repeated interview 24 h after	Filmed armed robbery and hos- tage negotiation	Alcohol: No effect ( $\eta^2=0.03$ ) Time: No effect, i.e. amount of recalled information did not increase/decrease in the repeated interview ( $\eta^2=0.01$ )	Alcohol: No effect ( $\eta^2=0.05$ ) Time: Slight increase in errors from first to second interview ( $\eta^2=0.11$ )
Hagsand et al., 2013	Dose: 0.7g/kg BAC = 0.06	Oral free recall; one-week delay	Laboratory/ filmed kidnapping	Alcohol: Small effect ( $\eta^2=0.06$ )	Alcohol: No effect ( $\eta^2=0.02$ )
Hagsand et al., 2015	Dose: 0.7g/kg BAC = 0.05	Oral free recall; Direct + one-week delay + repeated condition	Laboratory/ filmed kidnapping	Alcohol: Negative effect ( $\eta^2=0.14$ ) Time: Negative effect ( $\eta^2=0.09$ ) Repetition: Positive effect	Alcohol: No effect ( $\eta^2=0.02$ ) Time: Negative effect ( $\eta^2=0.09$ ) Repetition: Positive effect

## Summary: Alcohol's effects on memory processes

Alcohol exerts its primary effect on episodic memory, and the magnitude of the cognitive impairment is positively correlated with the consumed dose. For example, no impairing effect of alcohol on free recall memory has been detected in studies using low alcohol doses (below 0.4 g/kg), but it has been found when moderate (0.4 - 0.7 g/kg) to high doses ( $\geq 0.8$  g/kg) have been used, particularly with higher doses ( $> 1.0$  g/kg). Alcohol has been shown to disturb both attention and consolidation of memories, but the effects of alcohol on attention seem to be relatively small compared to its effect on memory consolidation (i.e., the process of maintaining attention, organizing information units into a meaningful mental picture and/or conceptualizing an event). The perceived information can thus be focused on and repeated by intoxicated persons within minutes of its perception, presumably at least in part by using the direct access retrieval mode (see Brainerd et al., 2002). However, they may not be as able as sober persons are to correctly and comprehensively reconstruct a detailed memory from associative clues and recalled gist information (Brainerd et al., 2002). Previous research has argued that Craik and Lockhart's process model is better suited to accounting for these alcohol-induced cognitive changes (Knowles, 2005). Taken together, it seems highly likely that alcohol in moderate to high doses creates a cognitive load and interferes with the creation of memory traces. In turn, a high cognitive load might limit the ability of a person to deliver a report that is both highly comprehensive and highly accurate during the recall process, which, according to Koriat et al., (2000), would predispose the person to reporting the information he/she is certain of (i.e., a quantity-accuracy trade-off).

The limitations of the basic research on alcohol's effects on memory – such as using non-emotional stimuli without a meaningful structure (e.g., word lists rather than a meaningful social scenario) – need to be corrected by conducting studies using more ecologically valid stimuli. Only a handful of previous studies have investigated alcohol intoxicated witnesses to crimes. Even fewer have investigated intoxicated witnesses to a violent interpersonal interaction, and to my knowledge, the studies included in the present thesis are the first to be performed on intoxicated witnesses' memory and perception of IPV.

## Two important factors: gender of witness and time of interview

The gender of the witness and when the interview is conducted have been shown to affect the memory performance of both sober and alcohol intoxicated witnesses. The present section outlines research on the effects of alcohol, gender and time of interview on the quantity, quality and type of information reported, both from the perspective of basic memory research and from that of an applied forensic context.

### How gender and alcohol affect memory

The issue of gender in memory research is old, and evidence of a female advantage in recall tasks has been provided since the beginning of the 20th century (Woolley, 1903). Results from recent studies of gender and episodic memory have confirmed this result, showing that women's episodic and verbal memory performance exceeds that of men (Andreano & Cahill, 2009; Canli, Desmond, Zhao & Gabrieli, 2002; Herlitz, Nilsson & Bäckman, 1997; Lewin, Wolgers & Herlitz, 2001). A female memory advantage has also been shown in an alcohol paradigm, where intoxicated women exhibited better recall of social information than intoxicated men do (Tucker, Vuichinich & Schonhaut, 1987). However, a review of the research on alcohol, gender and memory indicated that alcohol decreases this female advantage in episodic and verbal memory (Mumenthaler, Taylor, O'Hara & Yesevage, 1999). To my knowledge, only one previous study has investigated gender in an alcohol intoxicated witness context, and this study showed no support for a recall advantage for women (Hagsand et al., 2013). However, the majority of studies focusing on intoxicated witnesses' recall have not considered the possible impact of gender. They have not reported the mean BAC values for men and women separately, and have not investigated potential gender differences (e.g., Schreiber Compo et al., 2011; Van Oorsouw & Merckelbach, 2012; Yuille & Tollestrup, 1990). The following section will present arguments for including gender as a variable in research on alcohol intoxicated witnesses' memory for violent crimes.

### *Differential gender effects of alcohol*

Gender is a complex variable to examine in research on alcohol intoxication. Historically, this variable has often been purposefully avoided so as to minimize the differential effect of alcohol on cognition during the course of the female menstrual cycle (Andreano & Cahill, 2009). Even when disregarding the interaction effect between fluctuating hormone levels and alcohol, women have a smaller amount of body water, which affects the accumulated alcohol concentration in the blood (Mumenthaler et al., 1999; Söderpalm, 2011). Larger alcohol doses often generate significant gender differences in BAC levels, while smaller doses tend not to. For instance, no differential effect in BAC level has been found in studies utilizing a low alcohol dose, such as 0.3g/kg (Gartner, Schmier, Bogusz & Seitz, 1996; Lucey, Hill, Young, Demo-Dananberg & Beresford, 1999). However, when BAC is higher (from doses 0.7 g/kg and up), gender differences in BAC are enhanced and often result in significantly higher BAC levels for women than for men (Andreano & Cahill, 2009; Eckardt et al., 1998; Söderpalm, 2011). Clearly, then, gender is an important variable to control for because impairment in cognitive processes is positively correlated with BAC level (Curran, 2006; Mumenthaler et al., 1999).

### *Differential gender effects on memory of violent crimes*

In a study on sober witnesses (Lindholm & Christianson, 1998), women's memory performance exceeded men's for person descriptors, but not for action details of a violent event (viewed on film). This result was mediated by a female same-gender bias (i.e., the women remembered person descriptors regarding the woman in the violent event best), but no evidence of gender differences in episodic memory performance was found when same-sex bias was controlled for (Lindholm & Christianson, 1998). However, in another study on sober witnesses to a filmed robbery and assault, a female episodic memory accuracy advantage was found, particularly regarding descriptions of the victim and the setting (Areh, 2011). In addition to potential differences in the completeness of the report, there is some evidence that gender may influence witness reports concerning the type of information included. This was shown in a field study on quantity and type of information reported by male and female witnesses in 379 statements about 135 real-world assaults (McLeod & Shepherd, 1986). In this field study, female wit-

nesses reported fewer details about the accused person, but more details about themselves and the victim compared to male witnesses. This effect was moderated by level of violence (i.e., presence of injury or not), such that gender differences occurred only in reports of high-level violence. That is, if the violence was severe, women tended to focus more than men did on the victim and their own reaction. Unfortunately, the extent to which alcohol and same-sex bias affected the witness reports in the study in question is unclear, as no information on intoxication (during the event or the interview) or the victim's gender was reported in the study.

## How time of interview and alcohol affect memory

Regarding the interview, it is also important for police to know *when* interviews with intoxicated witnesses should be conducted. Is their memory performance better when they are still intoxicated and the retention interval is consequently short, or is it better when the witness is sober again and the retention interval is comparatively long? To investigate current interview practice and beliefs about intoxicated witnesses' performance, Evans et al., (2009) conducted a survey among police officers in the USA. The survey showed that the standard procedure of half of the investigated departments was to interview such witnesses only once, while the other half usually conducted two interviews with intoxicated witnesses: one in direct connection with the event (i.e., witness was still intoxicated) and one later when the witness was sober. The majority of police officers believed that these witnesses provided the most valuable information in direct connection with the event (i.e., while still intoxicated) (Evans et al., 2009). Furthermore, a survey of a district attorney's archives showed that both intoxicated and sober witnesses were most likely to be interviewed by the police on the very day the crime was committed (Palmer, Flowe, Takarangi & Humphries, 2013). Regarding differences in witnesses' memory performance during direct and delayed interviews, Yuille and Tollestrup (1990) showed that time of interview affected the completeness of the report, with more information being reported in direct connection with the event compared to after a week for both intoxicated and sober witnesses.

Another relevant aspect of interview timing is the effect of conducting several interviews. Immediate repetition of the stimulus material has been shown to have a beneficial effect of direct rehearsal on future recall (Badde-

ley, 2000). In fact, one of the basic assumptions of working memory function is that repetition of perceived information strongly enhances the ability to encode information into long-term storage, as well as to subsequently recall it. The result has been replicated in previous research on alcohol intoxicated and sober persons within and outside a witness context (i.e., with material that is meaningful and experienced during arousal and during detrimental pharmacological impact on cognition). For example, Odinet, Memon, La Rooy and Millen (2013) showed that sober witnesses who had been interviewed directly after the event reported more information (i.e., included new details) in a subsequent interview one week later than did witnesses who had their first interview one week after the event. The results also showed that accuracy rate did not differ between the direct and second interview. Regarding intoxicated witnesses, two studies have shown a beneficial effect of a direct interview on amount of reported information in subsequent recall (Hagsand et al., 2015; Yuille & Tollestrup, 1990). They have also confirmed that intoxicated (as well as sober) witnesses who gave a direct interview reported more information in a subsequent interview one week later. In the study by Hagsand et al., (2015), intoxicated and sober witnesses interviewed directly after the event reported an equal number of new details, at a similar accuracy rate, in the second interview one week later. Yuille and Tollestrup (1990) did not report presence of old/new information separately in their results, and, hence, it is not clear whether the increased amount of information one week later in reports by persons who had been interviewed directly after the event was due to the fact that: a) new information was added one week later, or b) information was retained better over time.

The scenarios used in these studies, as well as previously reviewed studies on alcohol intoxicated witnesses, have been relatively short (e.g., Van Oorsouw & Merckelbach, 2012: 2 min and 30 sec; Hagsand et al., 2013/2015: 3 min 50 sec). Therefore, it is unclear whether the cited effects of alcohol on completeness/accuracy and the beneficial effect of immediate interview on subsequent reports hold for intoxicated witnesses to a prolonged IPV event (approx. > 10 min). Therefore, the scenario used in the three studies reported in the present thesis is longer (i.e., requires more capacity for maintained attention) and arguably more complicated than the scenarios used in previous studies due to its many different chains of non-verbal actions and conversations, as well as different objects/background settings.

## Summary: Time and gender

Regarding time of the interview, research has indicated that both sober and intoxicated witnesses recall more information if they are interviewed soon after the event compared to after a delay. However, accuracy of the reported information does not appear to be particularly negatively affected by either elapsed time since the event or being in an intoxicated state while witnessing it. Furthermore, conducting repeated interviews, where the first is performed directly after having witnessed the event, also seems to benefit the quantity (and to a minor extent the accuracy rate) of the reported information in a subsequent interview in both sober and intoxicated witnesses.

Regarding research on the relationship between gender and alcohol and how it influences witness reports of violence, there is evidence that alcohol affects men's and women's blood alcohol concentration differently when doses are moderate to high. Also, the results regarding gender and memory recall performance of violent scenarios are mixed, with some (but not all) studies reporting an episodic memory advantage for women. Furthermore, the type of information a witness is prone to report seems to be affected to some extent by gender, although this effect may depend on situational factors such as gender of the victim. However, thus far, no previous study has investigated whether intoxicated and sober witnesses differ in reporting different types of information from a violent interpersonal crime, and whether gender or time of interview has any impact in such a situation.

# Information processing during alcohol intoxication

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As previously mentioned, studies have shown that alcohol intoxication (in doses spanning approx. 0.7 - 1.0 g/kg) diminishes the completeness, and in some instances accuracy, of memory reports. Another problem facing investigators and judges who assess reports by alcohol intoxicated witnesses is whether these witnesses' perception of social interactions has been affected by alcohol. Therefore, in this section, a dual-process theory of cognition is presented, which offers a general theoretical framework concerning the nature of the change in perceptive focus and information processing in an intoxicated state, both in direct and delayed interviews. In addition, research on how alcohol affects perception of social information is presented, especially concerning how it affects perception of aggression and guilt, as these concepts are crucial in a violent crime context. The appraisal disruption model is one of the theoretical foundations of the thesis, and especially important to note regarding changes in perception of aggression and guilt due to alcohol intoxication. The appraisal disruption model is based on the dual-process framework of cognition, but focuses specifically on how alcohol disrupts appraisal of situations. Therefore, it may generate more applied assumptions

regarding changes in attitude and information processing due to intoxication, which in turn affect perception of aggression and guilt.

## Information processing routes during intoxicated versus sober state

Appropriate information processing is of great importance to memory encoding and recall, as well as to logical decision-making. Generally speaking, according to the dual-process framework, there are two information-processing routes that humans use: a heuristic route (type 1 processing) and a cognitive route (type 2 processing) (Kahneman & Frederick, 2005, Tversky & Kahneman, 1973). There are several versions of dual-process theory, and the definition of the terms dual-process theory and type 1 and type 2 processing used here were obtained from Evans and Stanovich (2013), who emphasized the central role of working memory capacity in the definition of cognitive load. According to Evans and Stanovich (2013), type 1 processing is defined by rapid automaticity, which yields default responses if the process is not interrupted by type 2 processing, which entails complex reasoning processes and the capacity for hypothetical thinking. Type 2 processing also requires deliberate intention and loads heavily on working memory. For the heuristic information-processing route (i.e., type 1 processing), a person makes a judgment by using rules of thumb instead of making a thorough search of relevant facts available in memory. This heuristic route is more likely to be active in judgment when the judge has limited cognitive capacity available to make the decision, such as during intoxication<sup>1</sup> (Eckardt et al., 1998; Kahneman & Fredrick, 2005; Koelega, 1995; Tzambazis & Stough, 2000). Research on alcohol and cognition has shown that intoxication diminishes cognitive-abstracting capacity, attentive processing, planning, verbal fluency and memory (Hashtroudi et al., 1984; Hull & Bond, 1986; Peterson et al., 1990; Sayette, 1993). Taken together, these results indicate that heuristic processing is more likely to be used during intoxication than in a sober state,

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<sup>1</sup> This is a summarized version of the concept of dual-process theory, which encompasses several different versions and a comprehensive theoretical debate that cannot be covered here. For a further discussion of the dual-process theory concept, see Evans and Stanovich (2013).

which has been suggested in several experimental studies on alcohol intoxication (e.g., Gustafson & Källmén, 1989; Hashtroudi et al., 1984; Ogle & Miller, 2004; Sayette, 1993; Sayette, Wilson & Elias, 1993). In support of this line of reasoning, a comprehensive meta-analysis (34 studies included) showed that information processing in general was impaired by alcohol consumption (Hull & Bond, 1986). One study has also shown that social information processing in a laboratory setting changed due to alcohol intoxication (Ogle & Miller, 2004). In this study, there was an increased tendency among alcohol intoxicated witnesses, compared to sober witnesses, to a filmed social interaction to interpret a person in the scenario as hostile and a conversation as more provoking. It was suggested that the intoxicated witnesses in this study might have relied more on stereotypes of gender-appropriate behavior during an interpersonal conflict than their sober counterparts did (Ogle & Miller, 2004). This result is important to note because it, to my knowledge, is the only study thus far to investigate how alcohol affected *social drinkers'* processing of social information in a task involving interpretation of hostile/aggressive behavior.

There is a generally held belief in the justice systems in both the USA and Sweden (among the police, mock jurors and expert witnesses) that intoxicated witnesses are less credible (Evans & Schreiber Compo, 2010; Gustafsson & Lundberg, 2004; Kassin et al., 2001). This belief, combined with a view that these witnesses are too intoxicated to give statements that will allow the case to “move forward”, has been used as a reason not to proceed with a reported case of IPV or other forms of physical assault (BRÅ, 2009; Gustafsson & Lundberg, 2004). In addition, in IPV cases, alcohol intoxication is associated with withdrawal of police reports, i.e. that intoxicated witnesses often change their minds about their report and retract it (Gustafsson & Lundberg, 2004). Gustafsson and Lundberg (2004) attributed this behavior to an inability, when in an intoxicated state, to anticipate the consequences of reporting the event to the police. This behavior may be related to a limited ability to appraise the situation and evaluate the consequences of different choices due to alcohol intoxication, an interpretation supported by models such as the attention allocation model and the appraisal disruption model (Sayette, 1993; Steele & Josephs, 1988). However, this behavior may also be affected by alcohol's moderating effects on emotions. Alcohol has been shown to induce an elevated mood (primarily in the initial stage of intoxica-

tion), but also to create depressive states and a diminished sense of anxiety, fear and inhibition (Brown, Goldman, Inn & Anderson, 1980; Ito, Miller & Pollock, 1996; Steele & Josephs, 1990; Taylor & Chermack, 1993).

## Emotional witnesses and alcohol

Evidently, alcohol has a major impact on emotional states. However, for a forensic practitioner, it is also important to consider the nature of the emotional material's effect on perception and memory within a combined witness and alcohol paradigm. Some research has been conducted on emotionality of content and witness recall, but it is inconclusive. Results from research on sober witnesses are mixed regarding whether presence of violence in an event boosts memory performance or, conversely, impairs it (see Christianson, 1992 for a review). According to some research, memory for emotionally arousing and negative events has tended to be particularly durable and vivid (Brown & Kulik, 1977; Cahill & McGaugh, 1998; Curran, 2006; Safer, Christianson, Aury & Österlund, 1998). However, results from other studies have shown that high negative emotionality lowers both the amount of reported information and the accuracy of the information (Deffenbacher, 1983). An authority within this field, Elisabeth Loftus (cited in Christianson, 1992), nuanced the picture based on her own and others' research (e.g., Clifford & Scott, 1978; Clifford & Hollin, 1981; Loftus & Burns, 1982). She concluded that it is not the increased arousal during a stressful event that enhances memory performance (which was reported by a field study, Yuille & Cutshall, 1986), but rather the tendency for people involved in negative events to more often repeat their memory of the experience, compared to those involved in neutral events. In other words, according to Loftus, it is the effect of repetition of negative events and not the emotional arousal per se that enhances memory of such events.

Within alcohol research, the aspect of changes in emotional state during the course of intoxication is important to consider when comparing sober and intoxicated witnesses' memory for emotional events. Laboratory research on alcohol and emotion has shown that, during the initial phase of intoxication, a person experiences heightened arousal but that, during the subsequent phase, the effect is sedating. Thus, if we are to predict the impact of alcohol on encoding emotional material and on subsequent memory performance, it is also important to consider *when* during the period of intoxicat-

ion the event was witnessed. Studies on the relationship between memory and arousal during intoxication have shown mixed results. One line in this research postulates that positive stimuli are easier to remember if they have been encoded while intoxicated, as congruency exists between the nature of the stimuli and the positive mood state created by intoxication (Russel & Mehrabian, 1975). However, other research has shown the difficulty of separating recall of positive events and negative events in terms of amount of recall among intoxicated participants (Knowles, 2005). Knowles' (2005) research suggests that emotional events (positive and negative) that are encoded during intoxication are easier to remember, regardless of their emotional valence. According to Knowles, this result indicates that it is the arousal component of emotionality, and not whether it is positive or negative, that facilitates memory performance. However, it should be noted that during high BAC levels, alcohol can also induce complete amnesia for highly emotional events, such as involvement in a fight or sexual intercourse (Curran, 2006). It is not clear from this research whether this effect is due to the pharmacological impact of alcohol on hippocampal functioning, to a lack of repetition or to other cognitive effects induced by alcohol.

Regarding changes in cognitive processing due to intoxication, studies have found that alcohol may allow a person's emotions to more strongly influence his/her perception and judgment processes (Murphy, Monahan, & Miller, 1998; Taylor & Chermack, 1993). Moreover, studies within non-alcohol research that have manipulated cognitive load and gender factors have shown that emotions displayed by other persons influence a witness's perception and judgment processes. This influence of witnessed emotion on judgment seems to be especially strong when the witness's cognitive load is high (Ask & Landström, 2010). Furthermore, this influence seems to be moderated by whether the person's displayed emotion confirms or rejects expectations the witness has concerning how a person in the situation in question *should* act (e.g., if a congruency between the person's gender and expectations of stereotypical behavior) (Ask & Landström, 2010; Wrede & Ask, 2012). For example, if a female victim of a physical assault displays fear and sadness, she will arouse more sympathy and be more credible in the eyes of third party judges than if she displays non-female stereotypical emotions to the assault (e.g., anger). Hence, it seems important to the creation of sympathy and credibility that men and women display situational and stereo-

typically congruent emotions. Conversely, if a person breaks the norms concerning what type of emotions the observer expects from someone in that situation, this will lower sympathy and credibility (Ask & Landström, 2010; Wrede & Ask, 2012; Wrede, 2013), especially during high cognitive load, such as in an intoxicated state (Eckardt et al., 1998; Sayette, 1993; Sher et al., 2007; Steele & Josephs, 1990; Söderpalm, 2011). Because alcohol restricts the limited-capacity cognitive resources a person can control, it is plausible that alcohol intoxicated witnesses will be more prone to rely on the less complex and demanding heuristic cognitive processes, including stereotypes, when they perceive and interpret an event (Sayette, 1993). Furthermore, the majority of the studies in this area have shown that the anxiety-reducing effects of alcohol in general make anxiety-invoking material less salient, participants less fearful and risky situations perceived as less dangerous (see Sayette, 1993, and Pihl & Peterson, 1995, for reviews). Combined, these effects seem to incline intoxicated witness's perception of an IPV situation to be more affected by expectations of stereotypically gender-appropriate behavior, and also that they would perceive such a situation as less serious, compared to sober witnesses. The factors presented above of reduced anxiety and increased use of heuristic cognitive processes during intoxication are both considered within the appraisal disruption model (Sayette, 1993, 1999).

## Appraisal disruption model

One general view of alcohol intoxication is that it makes people less prone to think things through before making a decision. Seen from the dual-process framework of cognition (Chaiken & Trope, 1999; Kahneman, 2011), making decisions based on superficial information suggests that intoxicated people are more prone to make judgments using heuristic rules rather than searching for facts in memory (Kahneman & Fredrick, 2005; Tversky & Kahneman, 1973). Previous research has shown that when an observer's cognitive capacity is limited, as during intoxication, he/she will be more likely to use a heuristic cognitive route instead of an elaborative route when making a decision (Eckhardt et al., 1998; Hasher & Zacks, 1979; Kahneman, 2011; Tzambazis & Stough, 2000).

Two core cognitive concepts in theories of increased use of heuristic processing in an intoxicated state are *appraisal* and *attention* (Sayette, 1993; Steele & Josephs, 1988). In several earlier studies on how alcohol affects

attention, the authors have used alcohol myopia theory to predict and explain their findings (Clifasefi, Takarangi & Bergman, 2006; Hagsand et al., 2013; Josephs & Steele, 1990; Schreiber Compo et al., 2012; Van Oorsouw & Merkelbach, 2012). However, this theory was not used in the present thesis, as it has been argued to have certain limitations in explaining the cognitive consequences of alcohol's anxiety-reducing effects in the absence of distractors (see Sayette, 1993, for a discussion). Instead, the theoretical perspective on perceptions of aggression and guilt used in the present thesis was based on the appraisal disruption model (Sayette, 1993). The model is a theoretical framework based on two core components of heuristic processing: the automatic process of appraisal and the consciously directed process of attention. The basic assumption of alcohol myopia theory is that attention mediates the shallower information processing and reduction in anxiety caused by alcohol intoxication by reducing focus on the long-term aversive consequences of a choice, while enhancing focus on the short-term positive consequences of that choice (Steele & Josephs, 1990; Steele & Southwick, 1985). The appraisal disruption model assumes this in part, but also that the effects of intoxication are mediated by automatic cognitive processes of appraisal. Hence, according to the appraisal disruption model, it is likely that alcohol will affect perception both when the person's attention is left undisturbed and during distraction, but especially when the information is difficult to comprehend due to complexity/ambiguity.

### *Cognitive consequences of alcohol's anxiety-reducing effects*

The appraisal disruption model posits that alcohol intoxication makes a person more easily distracted from stressful information because of the decreased attention capacity available and constraints on automatic activation in association networks (Sayette, 1993). In other words, alcohol lowers the amount of available cognitive resources, which makes people less prone to maintaining their focus of attention and thinking creatively. Research conducted from both a neuropharmacological and a cognitive perspective confirms these assumptions. The neuropharmacological results have shown the sedating and anxiety-reducing effects of alcohol, among both men and women (Eckardt et al., 1998; Sayette, 1999; Sayette, Breslin, Wilson & Rosenblum, 1994; Söderpalm, 2011). The cognitive results have shown a lesser degree of attention in alcohol intoxicated participants, which contributes to a

lowering of the strength of their stress-response (Sayette, 1999; Sher et al., 2007). Together, these results indicate that alcohol intoxicated participants do not become as anxious as sober participants when experiencing a violent event for three reasons. First, alcohol dampens feelings of anxiety while the person experiences the event. Second, the level of anxiety also decreases due to their diminished sustained attention during the event. Third, intoxicated participants' associations during the event are fewer and lower in salience (Hashtroudi et al., 1984; Sayette, 1993). Hence, intoxication impairs the ability to anticipate aversive consequences using the mnemonic aid of previously stored events due to reduced ability to maintain attention and associate incoming information with existing knowledge (Sayette, 1993; Sayette, 1999)

In short, the following cognitive consequences of alcohol's anxiety-reducing effects are relevant to the present study. Alcohol lowers physiological responses to anxiety and attention to anxiety provoking stimuli, which together lower the general level of anxiety a person experiences in relation to an unpleasant event. At the same time, alcohol causes an increased use of cognitive attributes associated with heuristic processing, such as a reduced cognitive capacity in general (and a lower prefrontal activity in particular), decreased abstracting capabilities and increased use of automatic schemas. However, these basic results do not provide clear empirical directions for a potential difference between intoxicated and sober evaluators' perceptions of aggression and guilt in parties involved in a violent scenario. Previous research on the effect of alcohol on perception of aggression and guilt that is relevant to the current thesis is presented below.

## Aggression

It is now a well-established fact that a positive relationship exists between alcohol intoxication and increased aggression in different forms: alcohol heightens the baseline for overt aggressive behavior as well as the likelihood of harboring aggressive attitudes (Anderson & Bushman, 2002; Bushman & Cooper, 1990; Pihl & Peterson, 1995; Ogle & Miller, 2004; Pihl & Sutton, 2009; Taylor & Chermack, 1993). Studies of aggression using an electro-shock paradigm have shown that, compared to sober participants, alcohol intoxicated participants generally use higher voltage levels, increase the administered voltage level when provoked, and start their administration

of electric shocks to a fellow participant at a higher voltage (for reviews, see Ito et al., 1996 and Taylor & Chermack, 1993; for a discussion including expectancy effects, see Hull & Bond, 1986). This behavior has been explained in part by reduced fear of future aggression-related consequences during intoxication (Lau, Pihl & Peterson, 1995). Second, alcohol intoxication also increases aggressive attitudes (e.g., hostility) toward others, including an inclination, on the part of intoxicated persons, to assume that others want to insult/hurt them (Ogle & Miller, 2004). Some researchers have argued that intoxication tends to induce more accepting attitudes toward violent behavior, as intoxicated individuals' anxiety response, including fear of long-term consequences such as physical harm, is not as strong as that of sober individuals (Ito et al., 1996; Lau, Pihl & Peterson, 1995; Pihl & Peterson, 1995).

Furthermore, gender and the nature of the social context (here: presence or absence of provocation) seem to moderate the relationship between alcohol and perception of aggression in a social environment. Intoxicated men have been shown to interpret social interactions as more provoking compared both to intoxicated women and to sober men/women, and to be more likely to respond to a situation by using aggressive behaviors (Ogle & Miller, 2004; Giancola & Zeichner, 1995a, 1995b; Pihl & Sutton, 2009). Also, one study investigated gender differences in interpreting social information that varies in degree of aggression (Ogle & Miller, 2004). The results showed that when intoxicated men evaluated ambiguous social interactions, they perceived them to be more hostile than intoxicated women and sober men/women did (Ogle & Miller, 2004). Another aspect of the gender issue is that aggressive displays seem to be affected by the *target's* gender. However, the results are mixed. Some studies have shown that intoxicated men and women behave more aggressively toward a woman (Bushman & Cooper, 1990), while other studies have shown that intoxicated men perceived a man to be more hostile than a woman in different versions of a filmed scenario (Ogle & Miller, 2004).

In summary, previous research on the relationship between alcohol and aggression has shown that intoxicated persons more easily exhibit hostility and interpret ambiguous social interactions as more aggressive than sober persons do. Gender has been shown to moderate this relationship, with a more prominent effect of alcohol for men than for women in increasing hos-

tile behavior as well increasing inclination to interpret another person's behavior as hostile. However, the results are mixed regarding whether or not both the provocateur's and the victim's gender affects the aggressive response. An important factor in the studies on alcohol and aggression presented here is that they investigated the reactions of participants who assumed a subjective role in the experiment. Therefore, from a forensic point of view, the implications of these results are thus far limited to the reactions of offenders or victims. They are a starting point, but need not apply to a third party witness.

## Guilt

How people attribute guilt has been extensively studied, and within the framework of dual-process theory, Lerner and Goldman (1999) summarized it as follows: "Do we dispassionately and rationally search for evidence concerning sufficient and necessary causation, as well as evaluate the victims' intention and foresight, or do we automatically and intuitively sense when victims have violated fundamental rules of decency and wrongfully caused themselves or others to suffer? The evidence indicates that we do both of these things at various times, and that they can often lead to greatly discrepant judgments." (Lerner & Goldman, 1999, p. 638).

Perception of responsibility and blame in IPV situations (regarding both parties) has been studied in non-intoxicated participants, and several factors have been shown to influence such judgments. Some studies have shown that sober participants often perceive female victims of IPV as responsible, and that they blame these women for the aggression perpetrated against them (Kristiansen & Giulietti, 1990; Stewart & Maddren, 1997). This standpoint is supported by participants' claims that the women portrayed in the IPV vignettes could have avoided the violence had they been accommodating to their partners (Hart, 1993). Also, level of blame was affected by alcohol intoxication in the (here: male) assailant, as his intoxication was perceived by (sober) witnesses as a mitigating circumstance that reduced his culpability for his aggressive behavior (Richardson & Campbell, 1982; Stewart & Maddren, 1997). However, a study of sober witnesses to violence (not IPV), where the participants watched a film of a man/woman assaulting a man/woman (i.e., four conditions with identical modus operandi), showed that both female victims and female perpetrators were blamed less than male

victims/male perpetrators were (Lindholm & Christianson, 1998). The authors suggested that the witnesses ascribed the woman generally lower culpability due to stereotype assimilation (i.e. that women generally are viewed as less guilty both for the crimes they commit and when they are victimized).

Stewart and Maddren (1997) showed the importance of victim behavior in how blame is distributed between victims and perpetrators of IPV. In their study, the distribution of blame was influenced more by the victims' drinking behavior than by the assailants', and the police officers in the study who were asked to allocate blame were less likely to charge the assailant when they blamed the victim. Research on the role of witness characteristics in determining blame in IPV (with female victim) has also shown that this is an important factor, in that witnesses (both male and female) with traditional attitudes toward women's roles (i.e., attitudes endorsing stereotypical female behavior) blamed female IPV victims more and male IPV assailants less compared to their non-traditional counterparts (Hillier & Foddy, 1993; Stewart, Moore, Crone, DeFreitas & Rhatigan, 2012). Witnesses who endorse traditional views of women and are more accepting of violence attribute more blame to female perpetrators, as well as female confrontational IPV victims than non-traditionalists do (Stewart et al., 2012, see also Howard, 1984). Stewart et al., (2012) noted that since traditionalist witnesses view the normal female as "weak", females are at a disadvantage when they fail to conform to their stereotype, either by being a confrontational victim or by being an IPV aggressor. In other words, men who act violently toward a woman when unprovoked by her are generally blamed more, but women who act in an independent, non-nurturing, verbally aggressive manner may (especially among stereotype-oriented witnesses) be perceived as provoking negative reactions and are therefore more blameworthy (Stewart et al., 2012; Stewart & Maddren, 1997; see also Richardson & Campbell, 1982). Stewart and Maddren (1997, p. 923, see also Hillier & Foddy, 1993) suggested that "the attribution of blame is more complex than the simple application of universal causal schema and involves the individual's prior beliefs and attitudes toward women's roles" (Stewart & Maddren, 1997, p. 923).

These results show a mixed pattern regarding distribution of guilt in IPV (or similar two-person violence situations). In the present thesis, the overarching theoretical perspective used to examine alcohol's effects on wit-

nesses' perception of aggression and guilt is information processing, which is nuanced with an assumption of increased stereotype use (due to increased heuristic processing). An information processing approach, according to Brewer, "assumes that attribution of responsibility is essentially a judgment of the *degree* [sic] to which the outcome of some incident was determined or influenced by an act perpetrated by some individual" (Brewer, 1977, pp. 59). In sum, in a number of studies where the woman was portrayed as a victim, she was seen as more responsible for the perpetrated violence. However, in other studies (not including IPV) where the woman was portrayed as the perpetrator, and exhibited assertive and aggressive behavior, she was perceived as less responsible. A common factor in the designs used in the studies in question is that the portrayed woman's behavior is aggressive and therefore stereotype incongruent. To my knowledge, neither set of results has been replicated within an alcohol paradigm, and thus it is still unclear how guilt in an IPV scenario is distributed by intoxicated witnesses compared to sober witnesses.

# The three studies

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## Aims of the thesis

The connection between alcohol intoxication and IPV is well established, but complex (BRÅ, 2009; Capaldi, Knoble, Shortt & Kim, 2012). Although it is comparatively more common for children than for adults to witness IPV, adults do witness IPV at times. When they do, they often do so in contexts where alcohol is consumed (Dobash & Dobash, 1984; Greenfield et al., 1998; Gustafsson & Lundberg, 2004; Tjaden & Thoennes, 2000). It is also well known that intoxication alters many cognitive functions, but to the best of my knowledge no previous studies have investigated experimentally to what extent alcohol intoxicated witnesses' free recall of violence perpetrated in IPV situations differs from that of sober witnesses. Neither have previous studies investigated how alcohol may influence witnesses' perceptions of aggression and guilt in such a situation. Therefore, the purpose of the three studies in the thesis was to investigate how alcohol affects different aspects of witnesses' memory and perceptions of aggression and guilt in an IPV scenario in a controlled laboratory environment.

The first aim was to investigate how alcohol affected the completeness and accuracy of reports, as well as what types of information were included

when an interview was performed 10 min after witnessing the event (a direct interview) compared to one week after the event (a delayed interview).

The second aim was to investigate whether alcohol affected the witnesses' perceptions of aggression during an interaction set in different emotional contexts (i.e. neutral, verbally aggressive, physically aggressive), as well as how alcohol affected perception of guilt for the IPV situation's violent conclusion.

The third aim was to investigate whether gender (or the alcohol/gender interaction) affected the witnesses' memory or perceptions of aggression and guilt in an IPV-event.

## General introduction

Given that no previous study had investigated the effect of alcohol intoxication on witness recall and judgment of aggression and guilt in an IPV context, a laboratory design was used to diminish the effects of confounding variables on the results. The IPV situation that the witnesses were asked to recall was presented in a film produced especially for the three studies in the dissertation. The film was modeled based on the concept that IPV is an interpersonal interplay that escalates due to different situational determinants (Capaldi et al., 2012; Wilkinson & Hamerschlag, 2005). It pictured a man and a woman who first interacted neutrally in a home environment, but where the situation escalated to verbal arguing and finally to physical violence. The verbal arguing was mutual but the physical violence could not be construed as mutual combat, as the man's physical aggression was primarily offensive and the woman's primarily defensive. The participants were interviewed 10 min after they finished viewing the film in Study I and II, and in Study III, they were divided equally into two interview conditions: direct and delayed. Participants in the alcohol and sober group as well as men and women were evenly distributed over the two interview conditions. During the interview, they were asked to freely recall all that they could remember about the event, rate the level of aggression displayed by the actors in the three stages of the film and state how guilty they perceived the respective parties to be for the situation's violent conclusion. It is common for police to collect statements from the involved parties and witnesses directly, despite intoxication, when

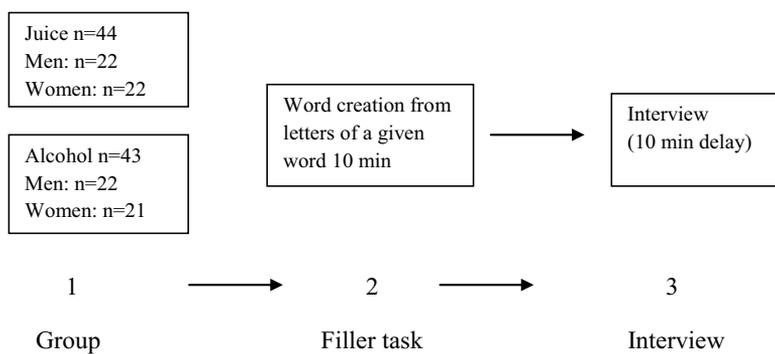
they are called to a domestic violence situation (Gustafsson & Lundberg, 2004). Hence, it is important to know how intoxicated witnesses, compared to sober witnesses, recall IPV interactions and perceive aggression and guilt in such situations. In order to investigate this, the recall as well as the assessment of aggression and guilt was performed 10 min after witnessing the event in Study I and II (data originating from the same data collection), where 50% of participants were intoxicated and 50% were sober. In Study III, a direct interview (10 min after viewing the film) was conducted with 50% of the intoxicated participants and 50% of the sober participants. All participants were interviewed one week later in a sober state, resulting in 50% of the participants having given their first interview one week later (delayed interview condition) and 50% having given a direct interview 10 min after the event and a second interview one week later (repeated interview condition).

## General method

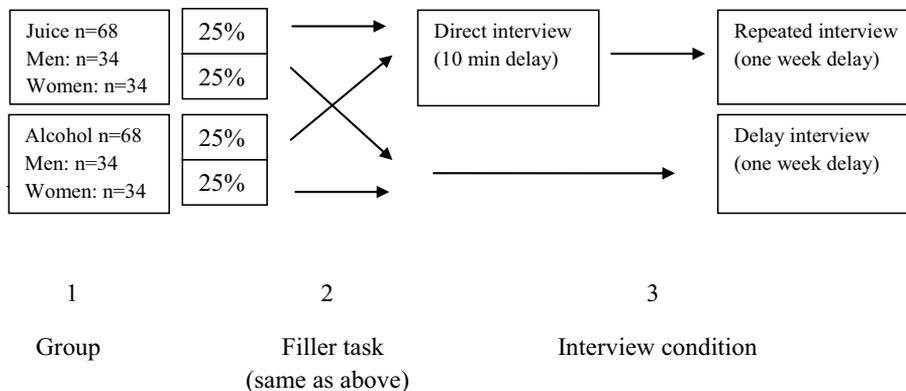
An experimental between-groups design – 2 (Alcohol intoxicated: Yes vs. No) x 2 (Gender: Man vs. Woman) – was used in the first data collection on which Study I and II were based. The participants in these studies were randomized into two groups, alcohol (0.7 g/kg) or control (0.0 g/kg), maintaining an even dispersion of men/women between groups. The dependent variables were: amount of information, type of information, and accuracy of information recalled (Study I), as well as perceived aggression and guilt (Study II) 10 min after watching a film picturing IPV in a home environment. Study III was based on a second data collection with an experimental between-groups design – 2 (Alcohol intoxicated: Yes vs. No) x 2 (Gender: Men vs. Women) x 3 (Interview: Direct vs. One-week delay vs. Repeated interview). The same dependent variables as in Study I were used in Study III, but the alcohol dose was higher (men: 0.8 g/kg; women: 0.75 g/kg), only 50% of the participants were interviewed 10 min after the film and all were interviewed after a one-week delay (see *Figure 2*). The studies were approved by the Regional Ethic Committee in Gothenburg (no.: 727-09, T-094-12).

Figure 2. Flow chart for data collections 1 (Study I and II) and 2 (Study III)

Data collection 1.



Data collection 2.



## Participants

The participants were healthy, non-problem social drinkers primarily recruited from The University of Gothenburg through posters inviting interested persons (fulfilling these three criteria) to send an e-mail including their telephone number to initiate the screening procedure. The screening procedure consisted of two steps. The initial screening was made by telephone and the inclusion criteria were: between 19-40 years, no current medication, no psychiatric or somatic problems, and drank alcohol regularly, but without current/history of alcohol or drug addiction/dependence. The persons who met these criteria were called to the laboratory in groups of five to seven for a more extensive screening. This second step included a medical examination by a physician, a self-rating scale for psychiatric symptoms (SCL-90; Derogatis, 1983) and for alcohol consumption (AUDIT; Barbor, Higgins-Biddle, Saunders & Monteiro, 2001). Participants were excluded from the study if they: had current problems that required medication or could be aggravated by alcohol (including nursing and pregnancy); had any current Axis I psychiatric disorder (American Psychological Association, 1994) or history of psychosis; had current or a history of alcohol or drug abuse or dependence; lacked fluency in Swedish; currently worked night shifts or had a body mass index < 19 or > 26. The screening procedure was supervised by an experiment leader. When eligibility had been established, participants were instructed to eat lunch before arriving at the laboratory. The final sample in the first data collection (used in Study I and II) consisted of 87 participants (43 women, 44 men). In the second data collection (used in Study III), the final sample consisted of 136 participants (70 women, 66 men).

## Laboratory environment

Both data collections took place in a laboratory for alcohol research that was furnished as a living room (with curtains, sofa, coffee table, lounge chairs, large screen TV, paintings, bookshelf), at the Addiction Biology Unit (Section of Psychiatry and Neurochemistry, Institute of Neuroscience and Physiology), of the Sahlgrenska Academy, University of Gothenburg. General terms of conduct during participation in the study were to refrain from using tobacco, and not to use any kind of electronics/reading material except those outlined in the *Instruments* section below.

## Instruments

### *Film*

The film was 11.5 min long and pictured an IPV situation involving a man and women in a home environment. The film was designed with three distinct stages of interaction, each portraying an interactional pattern between the actors in the following order: neutral, verbal aggressive and physical aggressive (each stage: 3 min and 50 sec long). In the neutral stage, the couple interacted in an emotionally neutral fashion, and discussed their day while sitting in a kitchen. However, at the end of the neutral interaction the man suddenly left the room. The woman followed him into the living room, and while sitting in a sofa, they began to argue about their private economy (i.e., verbal and non-verbal hostile interaction). The woman angrily left the living room for the hall and the man followed her. In the hall, the verbal argument continued (subject: economic mistakes and toward the end of the interaction the man accused the woman of infidelity) and took physically violent expressions. In the hall, the physically violent aspects consisted of the following: the man started to restrain the woman (e.g., holding her wrists) to stop her from leaving, she broke free and shoved the man two times (i.e., first shoving him away from her, then again into the hallway wall), the man slapped her in the face and, in the end, sat on her stomach, pinned her arm to the floor and threatened to hit her face with his fist. It is important to note that the man's physical aggression was primarily offensive and the woman's primarily defensive. The film ended with the man hitting the floor beside her head, getting up angrily, slamming the door behind him and the woman getting up from the floor slowly, apparently hurt.

### *Filler task*

The purpose of the filler task was to diminish a possible recency effect as well as prevent memory rehearsal directly after the film. The content of the filler tasks differed somewhat between the two data collections. See Appendix, Study I and III, for exact description.

### *Interview*

The interview in the first data collection consisted of five parts. Part I consisted of a free recall for the entire event in the film. The following three parts (II, III, IV) consisted of free recall and open questions regarding: the

emotionally neutral interaction in the kitchen (Part II), the verbally aggressive interaction in the living room (Part III), and the physically aggressive interaction (Part IV). Parts II, III and IV each ended with ratings of the level of aggression displayed by the man and woman, respectively, on a scale from 1-6 in that specific part of the film. In Part V, the participants rated how guilty they perceived the man and woman to be for the situation ending the way it did: with the woman physically hurt and the man storming out in a rage. In the final group of ratings, participants rated how engaging, realistic and unpleasant they perceived the film to be. For more information about the interview, see Study I.

In the second data collection, only one minor detail in the interview structure was modified. Part II, III and IV only contained one open question (i.e. did not contain free recall of the respective parts of the film) before the participants rated aggression in the respective parts.

## Measurements of alcohol

In the first data collection (Study I and II), we tried to induce a breath alcohol concentration (BAC) of 0.07% and in the second data collection (Study III) a BAC of 0.08%. To be able to achieve this pre-set degree of intoxication in all participants, the amount of alcohol administered to participants was adjusted to each participant's body weight. The amount was calculated in gram pure ethanol per kilogram body weight (hereafter referred to as g/kg). A solution of alcohol and orange juice (0.7 g/kg in first data collection, 0.8 g/kg for men and 0.75 g/kg for women in second data collection) was mixed before the experiment, and the participants received an amount adjusted to their bodyweight. No downward adjustment of administered amount of alcohol was made for the women in the first data collection, because earlier research conducted in the laboratory used for the present experiment had not revealed gender differences in BAC in the dose 0.7 g/kg alcohol. However, in the second data collection, an adjustment was made due to observed differences in BAC between the genders in the first data collection. Degree of alcohol intoxication was obtained from participants before and during the course of the experiment using a Breathalyzer (Alert J5, Alcohol Countermeasure Systems Corp. 2006) and is reported in BAC.

## Procedure

Participation took place at the laboratory in groups of two or three. Upon their arrival to the laboratory, they were given information about the general procedure and told whether the group would be consuming alcoholic drinks or just orange juice. The drinks were then administered and consumed during 15 min of social interaction in the group, managed by the experiment leader. BAC level was measured five min after concluded consumption, and then measured again every 15 min during the remaining experiment. This was followed by viewing the film picturing IPV on a TV screen. After the film, a filler task was conducted individually for a period of 10 min. Immediately after the filler task, each participant in Study I/II was interviewed separately in adjacent rooms by experienced interviewers (for detailed information regarding the procedure, see Study I). For Study III, only 50% of the intoxicated and 50% of the sober participants were interviewed directly, and all participants were interviewed one week later. After conclusion of the direct interview, the non-intoxicated participants left the laboratory. Participants in the alcohol group were sent to their homes by taxi. All participants in Study III were summoned one week later to be interviewed. To summarize, 50% of all participants in Study III were interviewed twice (Direct/Repeated condition), and 50% were interviewed once (Delayed condition). All interviews were performed using the same interview manual. Compensation for participation was 350 SEK (approx. £30) or 3 cinema tickets.

## Specific data analysis for Study I and III: Memory

All interviews were audiotaped, transcribed and coded prior to analysis in Study I and III. Three types of coding were performed for both studies: *completeness*, *accuracy* and *type of information*. Coding of completeness and accuracy was carried out according to guidelines used in previous research (Hagsand et al., 2013; Roos af Hjelmsäter, Strömwall & Granhag, 2011). Inter-rater reliability was assessed by having two persons code the same 20% of the material, and after differences were resolved through discussion, they coded 50% of the material each.

### *Completeness*

This measure was obtained by breaking down statements into information units. A unit was defined as a statement incorporating meaningful information about the witnessed scenario (for examples, see Appendix, Study I). Inter-rater reliability for completeness was 85.52% for Study I and 91.87% for Study III.

### *Accuracy*

Accuracy of reported information was established by rating each unit of reported information as either correct (i.e., a statement in accordance with the film) or incorrect (i.e., a statement disagreeing with the content of the film). Accuracy rate was then obtained for each participant's report by dividing the number of correctly reported information units for each participant by the total number of information units in his/her report. Inter-rater reliability was 90.32% for accuracy for Study I and 88.43% for Study III.

### *Type of information*

Each information unit was sorted into one of the following five categories: actions, verbal statements, thoughts/feelings, objects and subjective appraisals. The category *actions* incorporated reported information about what the man/woman in the film did; *verbal statements*, what the actors said to each other; *objects* incorporated all objects present in the film including descriptions of objects or the man's/woman's appearance; *thoughts/feelings* included participants' inferences about what the man/woman seemed to be thinking/feeling; *subjective appraisals* consisted of value laden subjective evaluations of the man/woman, their interaction or the situation as a whole, e.g. "I thought the man was irritating/The situation got out of hand for nothing". For example, the information units in the statement: "The woman left with the green blanket" would be categorized as: 1 unit=the woman (actor; a category not further analyzed in Study I and III), 1 unit= left (action), 1 unit=the blanket (object), 1 unit=the color (description of object). Inter-rater reliability for the combination measure regarding *what was described* (a measure combining the reliability with which an information unit was assigned to a specific category) was 85.30% in Study I and 87.79% in Study III.

## Specific data analysis for Study II: Aggression and guilt

In interview parts II, III and IV, the participants rated how aggressive they perceived the man and woman to be, as well as how guilty they perceived the man/woman to be for the situation ending in physical violence. The scales ranged from 1-6, 1 anchored as “not at all aggressive”/“no guilt at all”, while 6 was anchored as “extremely aggressive”/“all guilt”. To investigate whether the guilt was more polarized (i.e., one part being perceived as a lot more/less guilty than the other) in the alcohol group or the sober group, the ratings of guilt each witness ascribed to the man and to the woman were combined into a unitary measure of the witness’s assigned difference in guilt for the situation’s violent conclusion. A combined measure was used, as IPV is by nature an escalating, dyadic interaction (dynamic developmental systems perspective, see Capaldi et al., 2012; Wilkinson & Hamerschlag, 2005), and it is therefore important to capture how guilty the participants perceived the man and woman to be *in relation* to each other.

Also, this procedure was only used regarding the measure of guilt and not regarding aggression, for the following reason: While aggression can be perceived as a personality trait and in a concrete manner (i.e., a person may or may not exhibit different kinds of aggressive behavior), guilt is a more multifaceted and abstract concept (Alicke, 2000; Alicke, Mandel, Hilton, Gerstenberg & Lagnado, 2015). Studies have shown that, when allocating guilt, the impact of other factors is also considered. Examples of such factors and their influence are: characterological influences on causal judgment (Alicke et al., 2015); that a victim’s alcohol intoxication may heighten the perception of his/her guilt (Sperry & Siegel, 2011); exhibited passive behavior in a victim may lower the victim’s guilt (Ask & Landström, 2010); if a victim’s behavior is in accordance with the stereotypical gender expectations in the situational context in question (for expectations of stereotypical female IPV victims’ behavior, see Davies, 2007; Hoyle, 2007), then guilt is lowered (Stewart et al., 2012; see also Wrede, 2013, for a further discussion). Therefore, to diminish such effects on the two measures of the man’s and woman’s guilt, each participant’s ratings of the man’s and woman’s respective levels of guilt were combined to construct a single measure of the *distribution of guilt between the man and woman*.

## Results and conclusions

### Study I

The aim of Study I was to investigate to what extent alcohol intoxication affected the completeness, accuracy rate, and type of information reported by male and female witnesses to a film picturing two-sided IPV (however, *not* to be construed as mutual combat). Based on the quantity-accuracy trade-off model (Koriat & Goldsmith, 1996) and the results from previous studies (Hagsand et al., 2013; Hagsand et al., 2015; Yuille & Tollestrup, 1990), we predicted that alcohol intoxicated witnesses would report less information (Hypothesis 1), and that the accuracy rate would be the same as for sober witnesses (Hypothesis 2). Regarding the type of information reported, we conducted an exploratory analysis to investigate whether number of reported actions, objects, verbal information, subjective appraisals, and inferences about internal states (i.e., thoughts/feelings) differed between intoxicated and sober witnesses. No hypotheses were made concerning the effects of alcohol on type of information, as no previous research was available. Finally, potential gender differences in all of the dependent variables described above were also explored, but no hypotheses regarding the influence of gender were formed, because previous studies have shown inconclusive results (Hagsand et al., 2013; Tucker et al., 1987; Mumenthaler et al., 1999).

### Results

In Study I, the alcohol dose 0.7 g/kg alcohol generated a significantly higher BAC mean for women (BAC=0.08) than for men (BAC=0.07). Alcohol also reduced the completeness of reports for women but not for men, which partly confirmed Hypothesis 1. Alcohol did not affect the accuracy rate of women's or men's reports, which confirmed Hypothesis 2. Concerning type of information reported, alcohol intoxication reduced the number of actions and subjective appraisals reported by women. Alcohol intoxication in this dose had no effect on the type of information reported by men. Regarding the effect of alcohol on other types of information, amount of reported verbal information and inferred thoughts/feelings were marginally non-

significant for women, but reporting of objects was not affected by alcohol for women or men.

### *Conclusions*

Based on observations made in previous research, there is a strong indication that the lower completeness of reports and the fewer actions reported by intoxicated women compared to sober women are due to the higher BAC mean found among the women compared to the men (see Curran, 2006; Mumenthaler et al., 1999). Another interesting finding in Study I was that accuracy rate of the report was not affected by alcohol at these BAC levels in a no-delay, free recall interview. This finding supports the praxis of interviewing intoxicated witnesses (in the 0.7 g/kg dose) directly, and supports the notion held by some law enforcement officers that alcohol intoxicated witnesses who are interviewed during intoxication can deliver equally accurate reports as sober witnesses can (Evans et al., 2009). Finally, the results in Study I highlight the importance not only of calculating the BAC level from reported number of drinks (i.e., dose) when approximating the level of intoxication in a witness, but also of considering the gender of the witness. In previous studies on lower doses (< 0.7 g/kg), no gender difference has been detected. However, the women in Study I reached a higher BAC level than the men did when the drinks contained an equal alcohol concentration (dose: 0.7 g/kg), which indicates that when administering alcohol doses  $\geq 0.7$  g/kg, women must receive a lower dose to reach a BAC level similar to men's.

### **Study II**

The aim of Study II was to investigate how alcohol affected witnesses' perception of an IPV scenario regarding the seriousness of the displayed aggression, and the distribution of guilt between the man and woman, during an interview directly after the event. Based on the appraisal disruption model, alcohol intoxicated witnesses would rate the degree of verbal aggression (Hypothesis 1a) and physical aggression (Hypothesis 1b) displayed by the man and the woman in a witnessed IPV scenario lower than sober witnesses would. However, based on previous results by Ogle and Miller (2004) and the appraisal disruption model's inherent assumption that alcohol causes attitudinal and behavioral disinhibition (Ito et al., 1996; Sayette, 1993) as well as hostility bias (Pedersen et al., 2014; Subra et al., 2010), Hypothesis 2 pre-

dicted that ratings of aggression concerning the IPV parties' neutral interaction would be higher for alcohol intoxicated witnesses than for sober witnesses.

A difference in perceived guilt in relation to the IPV situation's conclusion was also predicted based on the appraisal disruption model and dual-process theory (Chaiken & Trope, 1999; Kahneman & Fredrick, 2005; Tversky & Kahneman, 1973). Taken together, these theoretical frameworks indicate that the less cognitive capacity a witness has for organization when encoding new information, the more prone the witness will be to using heuristic processing and stereotypes when distributing guilt between the man and woman involved in the IPV scenario. Therefore, we predicted that the difference in guilt between the man and woman perceived by intoxicated participants would be smaller than the difference perceived by sober participants (Hypothesis 3).

In addition, potential differences between male and female witnesses in relation to all of the above dependent variables were investigated. However, no hypotheses of gender influence were formed, as previous research has been inconclusive regarding the impact of gender on perception of aggression and guilt (Bushman & Cooper, 1990; Ogle & Miller, 2004).

## *Results*

Study II showed that, compared to sober witnesses, alcohol intoxicated witnesses perceived both the man's and the woman's physical aggression to be less severe. However, regarding the neutral interaction, the intoxicated witnesses perceived both parties to be *more* aggressive than the sober witnesses did. Perception of verbal aggression was not affected by alcohol. Guilt was more evenly distributed by alcohol intoxicated participants than by sober participants (i.e. the man was considered slightly less guilty and the woman as slightly more guilty by intoxicated participants, resulting in a more even distribution). Alcohol also appeared to have an anxiety-reducing effect, in that the alcohol intoxicated participants perceived the IPV scenario to be less anxiety-provoking than the sober witnesses did. No influence of gender or of the interaction between gender and alcohol intoxication on perception of aggression and guilt were found.

## *Conclusions*

Study II showed that the alcohol intoxicated witnesses perceived the IPV parties' physical aggression to be less severe and the neutral interaction to be more hostile than the sober witnesses did. In sum, the results tentatively support the possibility of generalizing several of alcohol's previously observed effects on perception of aggression in a non-witness context to a witness context. These effects include: (a) hostility bias (i.e., that alcohol makes neutral behavior seem more aggressive, see Ogle & Miller, 2004); (b) a more accepting attitude toward using physical violence; (c) an anxiety-dampening effect when assessing risk-filled situations, which in the current study may have affected how severe the physical aggression was perceived to be. All of these aspects are incorporated into the appraisal-disruption model (Sayette, 1993). Importantly, the results highlight that perception of aggression may not only be affected by alcohol, but also that it is vital to consider the effect of alcohol in interaction with the situational context. However, another explanation for this dual effect comes from source memory confusion. Because alcohol diminishes the possibility to maintain attention and impairs source memory, it may have impaired the ability to confine the perceived level of aggression to the respective parts of the film, which could have affected intoxicated witnesses' perception of the neutral/physically aggressive part. Hence, the cause of these functional effects is as yet unknown.

Regarding guilt, Study II indicated that alcohol intoxicated witnesses perceived the guilt to be more evenly distributed between the man and woman in the scenario, compared to sober witnesses who attributed more guilt to the man alone. The more equal distribution of guilt might be explained by a combination of the anxiety-dampening effect and the reduced cognitive capacities related to alcohol intoxication. Together, these effects may have increased stereotype reliance in judgments of guilt due to increased heuristic processing. Because the man in the IPV scenario acted in accordance with his stereotype and the woman in opposition to hers, intoxication resulted in the man being evaluated more leniently and the woman more harshly by the intoxicated witnesses. Accordingly, as shown in Study II, guilt was distributed more evenly between them. However, it is important to note that, despite their differences, both the intoxicated and sober witnesses perceived the man to be the guiltiest part, and the effect size regarding differences in perception of guilt was rather small.

## Study III

The aim of Study III was to investigate whether the effects of alcohol intoxication on the completeness, accuracy rate and type of information observed in Study I were present: a) in a higher dose that was downward corrected for women (0.8 g/kg for men, 0.75 g/kg for women); b) whether BAC  $\geq 0.08$  (here: severe intoxication) generated differences in the three measures while BAC 0.04 - 0.08 (here: moderate intoxication) did not; c) when the interview was delayed by one week; and whether d) a direct interview could counteract the destructive effect of time on memory (i.e., repeated interview condition), even when the encoding took place and the first interview was given in an intoxicated state.

### *Results*

Even though the alcohol dose was adjusted for women, it generated a slight gender difference in BAC. However, because no effect of gender was found on the completeness, accuracy rate or type of information present in the report and no difference was found in gender distribution between moderate/severe intoxication groups, the effects of moderate and severe alcohol intoxication in this dose on these three dependent variables were investigated. Regarding the effect of alcohol, severely (but not moderately) intoxicated witnesses gave shorter but equally accurate reports as sober witnesses did, in the direct, delayed and repeated interview condition. Regarding the effect of alcohol on type of information, severely intoxicated witnesses reported fewer actions and less verbal information compared to moderately intoxicated/sober witnesses. However, reporting of objects was generally not significantly diminished by alcohol at the severe/moderate BAC level, but a downward trend was observed in the present dose (i.e., a negative correlation with BAC, see Appendix, Study III). No significant interactions between alcohol, time and gender were found. Regarding the effect of time, all witnesses reported less information (i.e. lower completeness) one week later compared to the witnesses interviewed directly after the event. Time (i.e. one-week delay before interview) also decreased the accuracy rate of all witnesses compared to those interviewed directly, regardless of whether the witness was intoxicated during the event. Furthermore, regardless of intoxication during the event/first interview, the witnesses who had been interviewed in direct connection with the event gave more comprehensive reports (with a slightly hig-

her accuracy rate) one week later. No effect of gender was found on any of the dependent variables.

### *Conclusions*

Alcohol in the dose 0.8 g/kg (corrected to 0.75 g/kg for women, generating BAC's 0.04 - 0.15) decreased the amount of reported information when  $BAC \geq 0.08$  (here: severe intoxication), but not the report's accuracy rate in a free recall interview both directly after the event and a week later. The detrimental effect of time on completeness could be counteracted by a direct interview, also for those witnesses who had been severely/moderately intoxicated while witnessing the event and when reporting about it the first time. This confirmed the results obtained in earlier studies using a lower dose (see Hagsand et al., 2015). The fewer number of actions (but not objects) and lower amount of verbal information in the reports made by severely intoxicated witnesses confirm and extend the results obtained in Study I. These findings lend support to the assumption that severely intoxicated witnesses ( $BAC \geq 0.08$ ) report fewer items adhering to these types of information, but that moderate intoxication ( $BAC = 0.04 - 0.08$ ) does not have such an impact. One explanation for this may be based on the increased cognitive load observed during severe intoxication, and the fact that these types of information are more complex with shorter presenting time. They therefore require more focused attention and greater ability to organize incoming information and associate it with existing knowledge for correct interpretation of the event. All of these abilities have been shown to decrease with cognitive load, in general, and increasing intoxication (BAC), in particular.

## General discussion

In Study I, alcohol (dose 0.7 g/kg) reduced the completeness, but not the accuracy rate of the female witnesses' reports. Alcohol had no effect on the completeness or accuracy rate for male witnesses. However, with a higher dose (Study III: 0.8 g/kg for men, 0.75 g/kg for women), report completeness was reduced for both men and women who reached  $BAC \geq 0.08$ , but not for the intoxicated witnesses with  $BAC < 0.08$ . This elucidates the negative relationship between BAC and completeness, indicating that the reduction in amount of reported information is an effect of blood alcohol concentration (i.e., BAC) rather than one of gender. The reduction in reported information among severely intoxicated witnesses (here:  $BAC = 0.08 - 0.15$ ) was observed both in the direct and the one-week delayed recall condition. Accuracy rate was generally not affected by alcohol in the 0.7 g/kg (Study I) or the 0.8 g/kg dose (Study III) in either the direct or the one-week delayed interview condition. These results indicate that alcohol intoxicated witnesses can be just as reliable as sober witnesses within the doses used/BAC levels reached in present thesis. However, the effect of time was significant for both intoxicated and sober witnesses. For example, accuracy rate was lower in reports given one week later compared to directly after the event. Repetition (i.e., having given an interview directly after the event) also slightly increased the accuracy rate of reports given one week later for all witnesses, regardless of whether they were sober or intoxicated during the event and the first interview. Regarding the type of information reported in Study I, alcohol intoxicated female witnesses reported fewer actions, but not fewer objects. The reported amount of verbal information and inferred thoughts/feelings did not differ significantly between the groups in Study I, but the results showed a tendency for alcohol intoxicated women to report less information from these two information types than sober men and women did. In Study III, fewer actions and less verbal information was reported by both male and female severely intoxicated witnesses, both in the direct and one-week delayed interview condition. Objects were not significantly less reported by severely intoxicated witnesses, but they also showed a tendency toward reporting fewer objects when  $BAC \geq 0.08$ . No gender effects were found on the completeness, accuracy rate or type of information in Study I or III, and this will therefore not be discussed further.

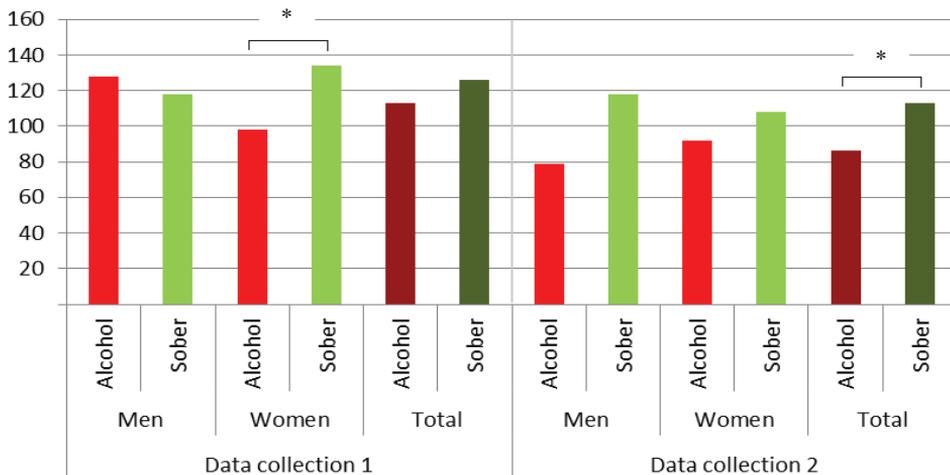
Regarding aggression and guilt, Study II showed that alcohol intoxicated witnesses, compared to sober witnesses, perceived the physical aggression to be less severe, but the behavior in the neutral interaction to be more hostile. Alcohol intoxicated witnesses also perceived the guilt for the situation ending in physical violence to be more evenly distributed between the man and woman in the film. No gender effects or interaction between alcohol intoxication and gender were found for the perception of aggression and guilt in Study II.

## Memory and alcohol

Many previous studies on alcohol and memory have used the fuzzy-trace theory (or adaptations thereof) to explain their findings. According to assumptions made in these studies on the effect of alcohol within the frame of trace theory/fuzzy-trace theory, alcohol makes memory traces less distinct and/or deep (Birnbaum et al., 1978; Hashtroudi et al., 1984; Sayette, 1999; Brainerd et al., 2002). According to previous research on alcohol intoxication, the reasons for this less distinct/deep encoding originate in a diminished ability to maintain focus of attention (Sher et al., 2007; Steele & Josephs, 1988), and in lowered cognitive processing capacity. Specifically, the following cognitive functions are negatively affected by alcohol: the ability to organize, to visually represent and make sense of visual information; to retrieve information from long-term memory; to maintain focus of attention; to achieve synthesis of thought (i.e., cognitive processing needed for abstract reasoning and decision-making) (Dry, Burns, Nettleback, Farquharson & White, 2012; Koelega, 1995; Tzambazis & Stough, 2000). The lowered cognitive capacity, or in other words increased cognitive load, due to intoxication found in these studies is a probable explanation for the lowered amount of information (completeness) reported by intoxicated women in Study I and by both male and female witnesses in Study III (see Figure 2). However, when interpreting the pattern of reduced completeness together with that of maintained accuracy rate in Study I and III, the fuzzy-trace theory and reduction in attention/cognitive capacity do not offer a sufficient explanation, because this combination alone would suggest a reduction in the accuracy rate as well. Instead, these results would be better accounted for by the *quantity-accuracy trade-off* model suggested by Koriat and Goldsmith (1996). In the design used in the present thesis, alcohol intoxicated witnesses followed

the pattern predicted by the quantity-accuracy trade-off model. According to this model, alcohol in the present doses (0.7 g/kg; 0.8/0.75 g/kg) when BAC  $\geq 0.08$  would weaken the memory traces formed during intoxication (see also Birnbaum et al., 1978). This would result in reduced completeness, but with an accuracy rate comparable to that of sober witnesses, if the witnesses strived to report as accurate information as possible and were not focused on reporting as much information as possible. This pattern of results has been supported by previous research on witnesses with similar BAC (Van Oorsouw & Merckelbach, 2012; Yuille & Tollestrup, 1990). However, the results from Study III also indicate a downward trend in the accuracy rate when BAC  $> 0.1$  (see Van Oorsouw & Merckelbach, 2012). In the study by Van Oorsouw and Merckelbach (2012), the accuracy rate as a function of intoxication was: sober = 91%; moderately intoxicated (BAC=0.06) = 89%; severely intoxicated (BAC = 0.17) = 0.81%. In Study III, it was: sober = 88%; moderately intoxicated (BAC=0.07) = 88%; severely intoxicated (BAC = 0.1) = 0.86%. However, this result may also have emerged if participants encoded all perceived information as accurately as the sober participants did, but did not perceive and encode as much information as the sober participants (i.e., less amount of information encoded due to high cognitive load or less available attention resources). In sum, the lower completeness but maintained accuracy rate in severely intoxicated witnesses' reports may have two explanations: (a) intoxicated witnesses may have refrained from reporting information they had encoded less comprehensively; or (b) they may have missed entire parts of the scenario but encoded all perceived information just as deeply as sober witnesses did. An indication of which explanation is more probable is linked to what kind of information intoxicated witnesses report. This is given in the discussion of results below (see *Types of information*).

Figure 3. Mean amount of reported information (completeness) in direct interview condition in the two data collection



\*  $p < 0.05$

### Types of information

The results on the different types of information the witnesses reported are in line with the above cited effects of alcohol on cognition and organizing abilities cited above, and they support the quantity-accuracy trade-off model. The types of information that were left out (actions in Study I, actions and verbal information in Study III) were the more complex information types (i.e., those which demanded more attention focus and/or cognitive capacity to be encoded in a distinctive and accurate manner). The amount of more concrete information (here: objects), was not reduced in reports by intoxicated participants. Based on these studies, it is not clear whether alcohol intoxication affected encoding or reporting of certain types of information. However, this pattern of results indicates that it was the more complex information, which required linking of information units, that was omitted most often when encoding/reporting information in an intoxicated state. Studies on alcohol and the linking of incoming information into a coherent memory have shown that this ability is reduced during intoxication (Sayette, 1993). This may be the reason why less complex information was reported by intoxicated

participants and the amount of simple information remained intact, as well as why this pattern was more marked in Study III where a higher dose was used. However, another difference between the types of information may have influenced the reporting of actions, verbal information and objects differently, and this needs to be addressed. Basic memory research has shown that memory of stimulus material increases with length of exposure. Because objects (e.g., a sofa) are generally exposed in the visual field for a longer time than, for example, actions (e.g. person 1 hit person 2 hard in the face) are, the conditions in the stimulus material of Study I and III allowed more time for witnesses to encode objects compared to actions/verbal information. In brief, objects may be harder to miss, which may be why alcohol affected reporting of actions and verbal information, but not that of objects. On the other hand, objects can be classified as peripheral information in the scenario, which – according to the assumptions of previous research on the alcohol myopia theory and attention allocation model – should be missed by intoxicated witnesses (Clifasefi et al., 2006; Steele & Josephs, 1988; Steele & Josephs, 1990). The exposure time and the salience of the information in the stimulus material (i.e. central or peripheral) are both important aspects to consider, but the research outlined below indicates that alcohol's effects are more complex.

This line of research builds on an assumption of decreased meta-cognitive abilities in an intoxicated state and suggests that intoxicated witnesses' reports consist to a larger extent of gist information and to a lesser extent of detailed information. This would support a quantity-accuracy trade-off based on shallower encoding in an intoxicated state, because the gist is still accurate but many details are lost in the encoding process (see Flowe et al., 2015, for a similar conclusion). It is well established that intoxication impairs the capacity to encode and remember sequences, maintain focus of attention and associate old and new information (Fletcher & Henson, 2001; Sayette, 1993; Sher et al., 2007). However, given that information can be maintained and manipulated in working memory even during very severe intoxication ( $BAC > 0.15$ , see Goodwin et al., 1970), but not stored in long-term memory, previous research has suggested that it is the lack of sufficient encoding that constitutes the greatest obstacle to memory formation at high BAC levels (Curran, 2006; White, 2003). Therefore, it is highly plausible that, during intoxication, detailed encoding and reporting of a sequence of interaction (verbal or non-verbal) would be harder than to encoding and reporting of an

object. It is also plausible to assume that when a witness strives for high accuracy, these negative cognitive effects would make him/her more prone to reporting gist-oriented information so as to avoid reporting errors regarding specific details (see Craik, 1977; Koriat et al., 2000; Lockhart & Craik, 1990). To encode and report information containing a high level of detail and complex associations in an informative and accurate manner (such as an IPV event), more meta-cognitive resources are required (Koriat & Goldsmith, 1996). A meta-cognitive deficit in an intoxicated state would affect encoding/reporting of objects less than encoding/reporting of actions or verbal information. Objects generally do not require as much elaboration for the information to be meaningful (e.g., “a skirt”), as opposed to an action embedded in a sequence (e.g., “he hit her after she called him an idiot”). Previous studies have shown that the ability to make complex associations and amount of meta-cognitive resources decrease as the level of intoxication increases (Casbon, Lang, Curtin & Patrick, 2003; Ogle & Miller, 2004; Sayette, 1993; Sayette et al., 1993; Simons & Spiers, 2003). Hence, decreased meta-cognitive resources may interact with the length of exposure regarding why the types of information that allow for considerable detail tended to be reported less often/in a less detailed manner by intoxicated witnesses, while the number of objects was reported to a similar extent by all witnesses in Study I and III.

### *The effect of alcohol and time of interview on witness performance*

Alcohol’s effects on the accuracy rate of reports given directly and after a delay are of substantial importance to how legal systems deal with intoxicated witnesses. Furthermore, conducting repeated interviews is common when handling intoxicated witnesses. Study III showed that it is of great importance to interview alcohol intoxicated witnesses directly to obtain a maximum amount of information, as they already in a direct interview reported less information compared to sober witnesses (see also Yuille & Tollestrup, 1990). By conducting a direct interview, the police also increase the quantity of information reported in future interviews with the witness in question (retention interval of one week tested in Study III as well as in previous studies, Hagsand et al., 2015; Yuille & Tollestrup, 1990). This result supports the claim that even witnesses who were severely intoxicated (BAC = 0.08 - 0.15) during different witnessed criminal events could to some extent be “inocula-

ted” against a decrease in reported information one week later, and that the amount of correct information reported by these witnesses one week later could also be slightly enhanced by conducting a direct interview (kidnapping, Hagsand et al., 2013/2015; theft/verbal aggression, Yuille & Tollestrup, 1990). Because alcohol puts a strain on witnesses’ already limited cognitive resources, its detrimental effect on memory seems to affect complex information, such as chains of actions and verbal exchanges, at lower BAC levels compared to at which BAC-levels it starts to affect amount of reported objects (Casbon et al., 2003; Sayette, 1993; Simons & Spiers, 2003). Hence, it is especially important to conduct an interview in direct connection with the crime when the event entailed a relatively large amount of complex information. In IPV cases, but also generally in cases containing interpersonal violence, concrete evidence is often scarce, and reliably establishing such complex chains of information is vital to the legal processing of such cases. Because the presence of witnesses to IPV is relatively rare and alcohol intoxication can increase the likelihood of IPV being committed in front of third-party adults, the legal system is, in these instances, provided with an opportunity to end what in most cases of IPV is a long series of physical and psychological violence that occurs behind closed doors. The results from the present thesis suggest that, by conducting a direct interview with alcohol intoxicated witnesses in such complex cases, more information can be obtained that is just as reliable as information given by sober witnesses. This procedure may, at least in some cases, provide the information needed to eliminate the word-against-word situation of the involved parties and end a long-standing cycle of violence.

## Perception of aggression and guilt

Legal praxis often requires that witnesses evaluate aspects of the situation in question, such as how they perceived the perpetrator’s and victim’s behavior regarding demonstrated degree of aggression or fear. For example, consider an investigation of IPV. The question of “Who instigated the fight?” requires a witness in such a setting to review his/her memory for the event, consider the remembered actions (verbal and physical) of both parties and the sequence in which they occurred, decide what he/she thought was the ultimate cause of the fight in this sequence and finally report his/her conclusion. When someone judges whether or not a situation is dangerous, it is not

simply a matter of evaluating the facts of the situation. An important component of evaluating the potential hostile nature of incoming stimuli is taking the emotional response that is aroused into account (Lerner & Goldman, 1999; for a review, see Damasio, 1994). When a person encounters aggression, he/she will often respond with feelings of fear or anxiety (Wrede & Ask, 2012), and the magnitude of both forms of emotional responses has been shown to decrease as alcohol intoxication increases (Pihl et al., 1993; Sayette, 1999; Steele & Josephs, 1988; Söderpalm, 2011).

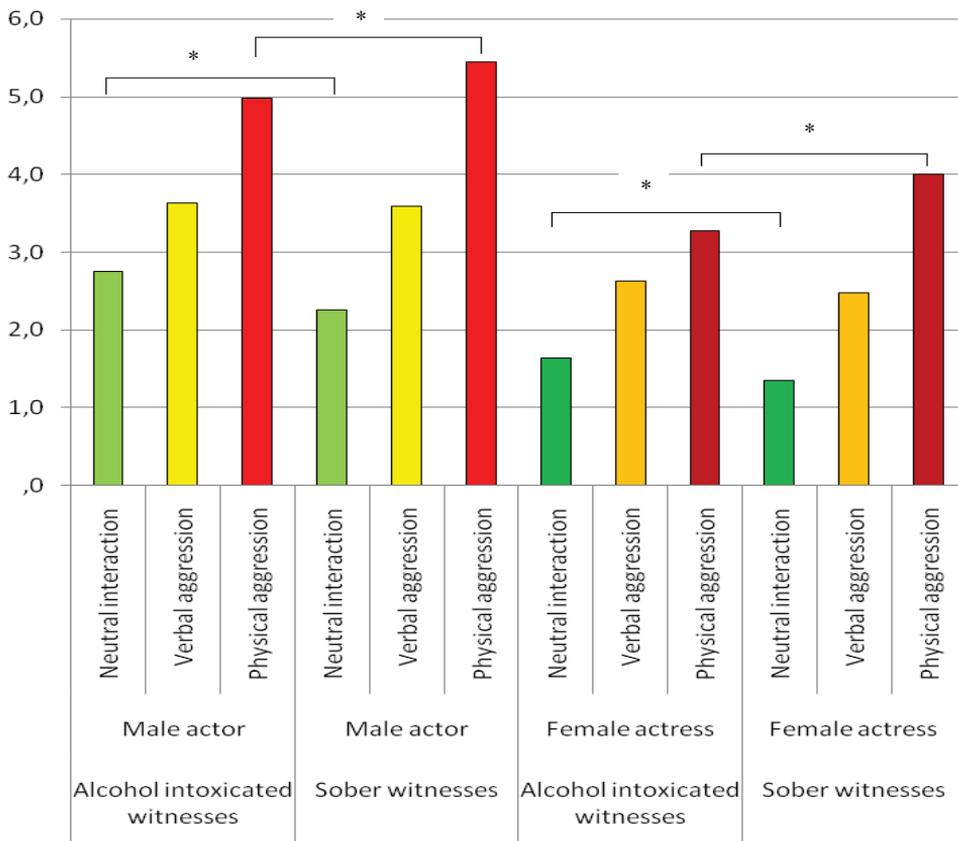
### *Aggression and anxiety in perceiving violence: the impact of intoxication*

Study II showed that alcohol had somewhat contradictory effects on the perception of aggression in different interactional settings. Regarding physical aggression, alcohol intoxicated witnesses perceived the physical aggression to be less severe than sober witnesses did. However, compared to sober witnesses, they perceived the neutral behavior to be more hostile (see Figure 3).

Because the results on alcohol's effects on aggression may (on the surface) seem contradictory, two important general questions follow. One pertains to the area of legal praxis and the other to knowledge of intoxicated witnesses' cognitive processes. First, does alcohol increase or decrease the perceived level of aggression from a witnessed IPV event? Second, why was neutral behavior perceived to be more hostile and physically aggressive behavior perceived to be less severe as a consequence of intoxication? In response to the first question, the results from Study II showed that the answer depends on the context. Hence, it is important to consider the nature of the situation when intoxicated witnesses are asked to assess the level of aggression displayed during the event (see Capaldi et al., 2012 and Wilkinson & Hamerschlag, 2005 for more information regarding situational determinants in IPV). However, it is important to note that intoxicated witnesses seem to react in the same way as the research has shown that intoxicated perpetrators react, i.e. with an increased hostility bias in ambiguous situations and increased acceptance of using physical aggression and/or perceiving aggressive actions to be less dangerous. Concerning the second question, the explanatory value of Study II is limited. However, if one considers the difference in perception of aggression between the neutral and physical aggressive

scenes of the IPV event (see *Figure 3*), alcohol's impact on changes in perception could be accounted for either by the appraisal disruption model or by fuzzy-trace theory.

*Figure 4. Mean ratings of the man's aggression in the neutral and physically aggressive context by intoxicated and sober participants*



\*  $p < 0.05$

*Appraisal disruption model:*

*Affective and cognitive consequences of intoxication*

The assumptions that alcohol may cause anxiety dampening and disinhibition are widely supported (see Ito et al., 1996 for a review), and the ap-

appraisal disruption model is based on alcohol's anxiety-dampening effects on cognitive/behavioral inhibition (Ito et al., 1996; Parrott, Gallagher & Zeichner, 2012; Pihl & Peterson, 1995; Pihl, Peterson & Lau, 1993). For example, an alcohol dose of 0.6-1.3 ml/kg has been demonstrated to increase the potential for physical aggression (Sayette et al., 1993). According to the disinhibition hypothesis, the dampening of anxiety caused by alcohol intoxication increases risk-taking and anti-normative behavior in situations that in a sober state would be perceived as frightening or uncomfortable (Eckhardt et al., 1998; Ito et al., 1996; Parrott et al., 2012). Presumably, this results in an increased propensity to respond aggressively in relatively neutral as well as physically violent situations, as intoxication lowers fear of aversive consequences such as potential physical harm, which means aggressive behavior is no longer perceived as equally anxiety-provoking (Ito et al., 1996; Pihl et al., 1993; Pihl & Peterson, 1995). Research on alcohol and aggression has shown that anxiety cannot be used as effectively as a social compass in interactions during intoxication, that intoxication increases proneness to perceive another person as hostile (especially in ambiguous social situations) and to react more aggressively toward a non-provocative as well as provocative counterpart (Anderson & Bushman, 2002; Bushman & Cooper, 1990; Hull & Bond, 1986; Ogle & Miller, 2004; Taylor & Chermack, 1993). In other words, alcohol's disinhibiting and/or anxiety-dampening effects can create a "hostility bias". In this context, such a bias both make neutral interaction seem more aggressive, and include a diminished fear of the consequences of physical aggression which might make such behavior seem more benign and/or like a more acceptable way to resolve conflict.

The appraisal disruption model provides a promising theoretical framework, as it may account for both the cognitive and the emotional consequences of intoxication mentioned above. However, due to the design used in the present thesis, fuzzy-trace theory must also be noted. Fuzzy-trace theory might be an alternative explanation for the results, because in the design used, the witnesses were asked about their perception of the social interaction after the entire event was witnessed. This may have caused the impressions from the different stages of interaction to become intertwined, especially among the intoxicated witnesses. However, the underlying vital aspects of fuzzy-trace theory, which figured in the hypotheses in Study II, were that intoxicated participants had a decreased ability to establish distinct

memory traces that lead to distinct units of information. In turn, these units are stored in a distinct order reflecting the to-be-remembered event. These aspects are also incorporated into the cognitive part of the appraisal disruption model. According to the appraisal disruption model, alcohol would affect perception of aggression via impact on emotion (primarily fear) and cognition for three reasons (see Sayette, 1993 for the theoretical framework; supported by Birnbaum & Parker, 1977; Craik, 1977; Jones & Jones, 1977; Steele & Josephs, 1990). First of all, because it disrupts the appraisal of stressful information, in part by diminishing the power of the stressor to activate previously stored memories of stressful situations (and elicit fear) and in part by decreasing the ability to maintain attention. Second, because it constrains the spread of activation of association between newly perceived and previously stored information in long-term memory. Third, because it lessens the ability to perceive the meaning in a scenario, partly owing to alcohol's impairing effect on organization strategies during encoding.

Research on the cognitive effects of alcohol has shown that intoxication causes failure to take long-term consequences into account (i.e., intoxicated attention is primarily directed at salient information with immediate consequences). However, previously used models do not include non-conscious anxiety as a contributing cause of this change in perception (see attention allocation model; Steele & Josephs, 1988). Both decreased ability to maintain attention and anxiety have been established as effects of alcohol. Therefore, the appraisal disruption model appears to be a promising theoretical framework for future studies on intoxicated witnesses' perception of aggression. Study II advances previous research on alcohol and aggression, as the results indicated that third-party intoxicated witnesses may have experienced an anxiolytic effect that co-occurred with an altered perception of the aggression displayed by an IPV perpetrator (here: a man using primarily offensive physical aggression) and victim (here: a woman using primarily defensive aggression). In sum, the results showed that the man and woman in the film were perceived as more hostile in a neutral setting and less aggressive in a physically aggressive setting. This result indicates that situational variables (neutral social setting vs. physically aggressive), in combination with alcohol, had an impact on witnesses' perception of aggression in line with the appraisal disruption model's assumption of alcohol's disinhibiting effect on cognition and behavior (Ito et al., 1996; Sayette, 1993).

### *Guilt in IPV: The role of intoxication and heuristic processing*

The results of Study II showed that the female in the scenario was perceived by both intoxicated and sober witnesses to be comparatively less guilty than the man. It should be noted that the woman was the victim of the most offensive physical violence and perpetrated defensive violence, whereas the man was the perpetrator of the most offensive physical violence. However, compared to sober witnesses, the intoxicated witnesses perceived the parties as more equally guilty, with the man's guilt perceived as slightly lower and the woman's as slightly higher.

The pattern in Study II can in part, but not in sufficient detail, be explained by the appraisal disruption model, which postulates that alcohol dampens anxiety and disturbs higher-order cognitive processing. According to the assumption regarding anxiety in the model, the reduced guilt ascribed to the perpetrator may stem from less strong feelings of anxiety/fear among intoxicated witnesses (Sayette, 1993; see also other research on alcohol induced anxiety: Ito et al., 1996; Pihl & Peterson, 1995; Sayette et al., 2004). However, the model can only sufficiently account for the decrease in guilt ascribed to the violent perpetrator; it does not in sufficient detail explain the increase in guilt ascribed to the violent victim. This mixed pattern regarding perception of guilt requires a more nuanced cognitively oriented theoretical framework, based on the dual-process theory (Chaiken & Trope, 1999; Kahneman, 2011). In line with dual-process theory, the alcohol-induced decrease in cognitive capacities may have increased alcohol intoxicated participants' use of automatic processing (System 1). System 1 is a cognitive mode that employs heuristics and therefore also increases the risk of basing decisions on rules of thumb and stereotypical notions. Research has shown that intoxicated persons are less prone to analyze the long-term consequences and take counterarguments into consideration. This tendency applies both to moral and to social decision-making and indicates that intoxication creates an increase in heuristic processing in general (Denton & Krebs, 1990; Ogle & Miller, 2004). The relevance of this theoretical framework to the results of Study II is supported both by the general expected increase in heuristic information processing proposed by the appraisal disruption model (Sayette, 1993) and by the narrowed cognitive focus postulated by the attention allocation model (Steele & Josephs, 1988) due to alcohol intoxication.

### *Stereotype use*

A reason for the more even distribution of guilt reported by the alcohol intoxicated witnesses may be increased stereotype use during an intoxicated state. Stereotypes are more likely to be used in situations where cognitive load is high (Ask & Landström, 2010; Kahneman, 2011). Alcohol intoxication puts a strain on information processing and therefore makes it more likely that heuristics and stereotypes (i.e., cognitive schemas that require less effort to employ compared to using analytic processing) will be used (Ogle & Miller, 2004). According to prevailing gender stereotypes, assertive and aggressive behavior is seen as comparatively more normal for a man to display (Ahola, 2012; Davies, 2007; Hoyle, 2007; Lindholm & Yourstone Cederwall, 2010), and this behavior is presumably more tolerated by intoxicated persons compared to sober ones (Ogle & Miller, 2004). As a consequence in a stereotype-prone cognitive mode, female aggression is more unusual, which would make the judge more biased to focus on such unusual behavior when he/she evaluates the woman's entire part in the scenario (see Ask & Landström, 2010; Wrede & Ask, 2013). In other words, the woman's assertive and aggressive behavior in the IPV scenario is not in accordance with traditional female non-violent behavior, and would therefore, from a stereotype point of view, be judged with less sympathy and she would be assigned more guilt. In short, and with regard to stereotypes: an IPV event that involves an active man and an active woman should tend to bias intoxicated witnesses' perception, or any other witnesses who experience cognitive load (or are stereotype-oriented for other reasons), to the man's benefit, because he is acting in accordance with his stereotype and decreased sympathy for the woman, because she is acting in violation of her stereotype.

This is only a tentative explanation for why alcohol intoxicated witnesses perceived the man's guilt to be somewhat lower and the woman's guilt to be somewhat higher, but research on sober witnesses has shown that female victims of IPV and rape are perceived as relatively more guilty when they display stereotypically non-congruent behavior (Davies, 2007; Hammock & Richardson, 1993; Richardson & Campbell, 1982; Sperry & Siegel, 2011; Stewart et al., 2012; Whatley, 1996). Specifically, some of this research has shown that female victims of violence who did not fit the stereotype of the passive victim (vulnerable, fearful and fragile) did not elicit third-party sympathy to the same extent, which in turn diminished their credibility and affec-

ted the case verdicts (Ask & Landström, 2010; Davies, 2007; Hoyle, 2007; Schult & Schneider, 1991; Wiener, 1980; Wrede & Ask, 2013). Furthermore, research has shown that exhibited stereotypically incongruent behavior is viewed as more informative about the person's character, especially under high cognitive load, which prompts an increased reliance on System 1 processing (Jones & Davies, 1965; Kahneman, 2011; Skowronski & Carlston, 1989). Taken together, such circumstances increase the probability that the perpetrator will be perceived as less guilty and the victim as guiltier (Ask & Landström, 2010; Klippenstine & Schuller, 2012). It also indicates that all these effects would be more pronounced under high cognitive load, such as during intoxication.

In sum, regarding guilt, the present study indicates a possible relationship between an increase in cognitive load, and an increased inclination to use stereotypes of victim-appropriate behavior when evaluating the guilt of involved parties in IPV, especially when norms concerning stereotypical gender behaviors are not met. Because guilt is an abstract concept that requires ample cognitive resources to enable consideration of several variables, this would cause intoxicated witnesses to base their decision of guilt on their preoccupation with the deviance from stereotypical behavior to a comparatively larger degree. Hence, when stereotypes are not confirmed, alcohol intoxicated witnesses might – due to less available cognitive resources – become preoccupied with the actions that constitute a deviance from said stereotypical behavior, and distribute guilt differently. This might also explain why the woman (whose behavior contradicted stereotypical female behavior in IPV) was judged to be somewhat guiltier, and the man (whose behavior confirmed stereotypical male behavior in IPV) to be somewhat less guilty by intoxicated witnesses compared to sober witnesses. This reasoning might form a starting point for more research on how alcohol intoxicated compared to sober witnesses perceive guilt in parties involved in a physically aggressive interaction.

## Limitations and future directions

It is important to note that the form of IPV focused on in the present thesis is confined to male-to-female IPV in heterosexual couples, which is the form most often investigated in previous research (Clements & Schumacher, 2010; Foran & O'Leary, 2008). Although men are frequently victims of diffe-

rent forms of IPV, and both male and female victims report negative physical and mental health outcomes (Coker et al., 2002), women are more frequently victims of the most severe form of IPV (Archer, 2000; Kelly & Johnson, 2008). Furthermore, the most commonly perpetrated physical violence by women in IPV situations is self-defense against physical attack by the man (Hamberger & Larsen, 2015). It should also be noted that persons in homosexual couples are frequently exposed to IPV (McClennen, 2005). In a nationally representative sample ( $n > 14,000$ ), Messinger (2011) found that verbal, physical as well as sexual forms of IPV were more frequently experienced by persons with a history of same-sex relationships. Hence, this is still a neglected research area that is worthy of further investigation.

There are three limitations to the studies in the thesis that are connected to the above-mentioned limitations of the stimulus material used, and hence, that have implications concerning the possibility to generalize the results. First, it is not clear from the present thesis whether the results are specific to IPV or whether they can be generalized to other violent interactions in which two parties are involved (e.g., physical aggression between friends or strangers). Second, as only one scenario was used, it is not clear from the present thesis whether the evaluations of the man's and woman's aggressive behavior are representative of how men/women in this kind of IPV situation are generally evaluated or whether the results are connected to the specific male/female actors in the film. Therefore, it is not clear, based on the present thesis, whether the results can be generalized to men and women or to persons in general (regardless of gender) who exhibits these kinds of aggressive behaviors. Third, as indicated previously, because the film was modeled after just one form of IPV commonly reported to the police (i.e. the man as primary aggressor and the woman perpetrating defensive aggression), it is not clear whether the present results can be generalized to other kinds of IPV situations. Important future areas of investigation for such studies are IPV involving homosexual couples, IPV where a woman is the primary physical aggressor and the man is defensively aggressive, or IPV where the man/woman takes a passive role when victimized. All these limitations should be acknowledged and viewed as starting points for future research. In sum, due to the focus in the present thesis on a specific form of IPV in heterosexual couples, the results might only be applicable to IPV among

heterosexual couples where the man is the primary aggressor and the woman is the victim (i.e., exposed to the most severe violence).

Due to gender differences in BAC, the results of Study I were not conclusive concerning whether the obtained difference in completeness of reports between intoxicated and sober women (which was not found for men) was caused by gender or by BAC level. One conclusion drawn from Study I was that future studies should correct for the physiological differences between men and women (e.g., female bodies have a proportionally smaller amount of water), which might cause the higher concentration of alcohol in women (Mumenthaler et al., 1999; Söderpalm, 2011; White, 2003). This was done in Study III. However, the downward correction was not sufficient to obtain a non-significant difference in BAC levels between men and women. Future studies should therefore employ a larger correction than 0.05g/kg at the dose 0.8 g/kg. Nevertheless, the difference between BAC in men and women was comparatively smaller in Study III, and generally no impact of gender or the interaction between alcohol intoxication and gender was found on any of the dependent variables. The demographic group used in the present thesis (i.e., social drinking university students with no current medical or psychiatric illness) is a highly relevant, but often neglected, group to study regarding IPV (Shorey et al., 2011). IPV is present in all social groups, but is more frequent among young people and also more severe on occasions when alcohol has been consumed. However, other demographic groups should also be included in future studies to broaden the possibility of generalization to other constellations included within the IPV concept (e.g., older couples and same-sex couples). It is particularly important to study persons with alcohol addiction or other alcohol-related psychiatric diagnoses, as these groups are overrepresented in violent crimes involving alcohol, including incidents of IPV.

The principal future direction regarding the results on memory performance obtained in Study I and III is to replicate these results and to test the assumptions of the quantity-accuracy trade-off model regarding the performance of intoxicated witnesses at different interview times (e.g. direct/delayed/repeated) with different interview structures (e.g., free recall/cued recall/closed or leading questions) within a forensic setting. For example, future studies could employ response criterion measures, which were not included in the present study. This might be an interesting starting

point for research into theories that model how alcohol affects the relationship between the completeness and accuracy rate of the report. The effect of different interview formats should also be tested on intoxicated witnesses, as the free recall design used in Study I and III might yield different results than a structured interview format including open and closed questions. Concerning the results, obtained in Study I and III, on the type of reported information, future studies should examine whether it is the complexity of the information (in the thesis exemplified by ‘actions’) that makes it more likely to be left out of free recall reports when participants are alcohol intoxicated ( $BAC \geq 0.08$ ), while the amount of reported concrete/tangible information remains the same as for sober persons.

The results from Study II regarding the variations in ratings of neutral and physical aggression, as well as the difference in distributed guilt between the alcohol intoxicated group and the sober group, must also be replicated in future studies. For such studies, it should be of great value to investigate participants’ propensity for stereotype use as well as potential differences in anxiety using physiological measures. Establishing the extent of type 2 processing, use of heuristics and personality-based proneness to use of stereotypes (e.g., a predisposition toward using authoritarian attitudes) is important for further theoretical development in witnesses’ perception of IPV.

Another issue to be examined in future studies is the fixed order of the ratings in the present study: aggression was rated from a neutral to a physically aggressive context, and this was done before participants rated guilt. This approach may have produced order effects in ratings, and thus future studies should control for this eventuality by alternating the order and/or using only one kind of emotional scene per experimental group. However, IPV as well as interpersonal violence in general is principally a process, an interaction in which aggression escalates; it is not an isolated act. Therefore, it is doubtful whether such possible order effects would prevent the results from being generalized to a legal setting, as police will always interview witnesses after the event. Related to this issue is the question of causality regarding whether changes in perception of aggression and guilt are caused by the anxiolytic and cognitive effects of alcohol (i.e., a dampening of emotional response and changes in cognitive capacities), or by source-memory confusion. Source memory confusion is especially important to take into account when interpreting the ratings of aggression, as the impressions from the phy-

sically aggressive context could have been mixed with those from the neutral context. Interesting starting points for such research are to control for the impact of alcohol on cognitive capacities such as sustained attention, heuristic processing and reliance on traditional gender stereotypes. These issues regarding the cause of changes in perception of aggression and guilt are highly relevant on a basic level of alcohol research and crucial to creating a solid theoretical framework. However, because alcohol affects emotional response, information processing and memory encoding simultaneously, this is probably of minor practical importance in a legal context.

It is also important for the future of this research area to conduct field research on alcohol intoxicated witnesses to IPV, as the experimental results analyzed in the present study should be confirmed in a more ecologically valid setting. Such a setting should include, among other variables, information on the nature of the witnesses' relationship with one/both parties. However, the results from Study I, II and III will hopefully generalize to several real-world settings, such as witnessing an event at a home party or in a bar. Therefore, a general recommendation for future directions in research on alcohol intoxicated witnesses is that it is important to investigate how well the results from the present and previous studies generalize to field experiences. The police may help in this process by establishing routines that enable more field studies on the effects of alcohol on involved parties in IPV. By making it routine practice to measure involved parties' and witnesses' potential alcohol intoxication using a Breathalyzer and putting the values on record, more comparisons can be made between laboratory studies and real-life cases, thus allowing revision of hypotheses in this research area.

## Conclusions

The current thesis presents the first three experimental studies on how alcohol may affect the memory and perception of adult witnesses to IPV. Regarding memory, the thesis indicates that alcohol diminishes, in a dose-dependent manner, the amount of information a witness reports from an IPV event, but not the accuracy rate of the reports. It also shows that it is preferable to interview intoxicated witnesses as soon as possible, as they (when  $BAC \geq 0.8$ ) already in a direct interview report less information than sober witnesses do. Delaying the interview a week would further decrease the amount of information reported by intoxicated witnesses. To counteract the

process of forgetting, an interview conducted directly after the event may above all increase the amount of reported information witnesses remember one week later, despite intoxication during the event and the first interview. Hence, the results from the present thesis indicate that intoxicated witnesses to IPV (at the doses used here) should be interviewed as soon as possible and not automatically dismissed as unreliable, even though they may give shorter reports. Furthermore, intoxicated witnesses did not perceive the IPV event to be equally unpleasant as the sober witnesses did. Alcohol changed their perception of aggression and guilt, and they perceived the physical aggression to be comparatively less severe, but interpreted the neutral social interaction to be more hostile. The intoxicated witnesses also perceived the man and woman to be more equally guilty for the IPV situation's physically violent conclusion, while the sober witnesses attributed more guilt to the man. These effects may be accounted for by the anxiety-dampening effects of alcohol and an interaction between anxiety-dampening and sustained attention (as well as fewer associations in both number and salience) during an intoxicated state of perception, information processing, memory encoding and recall. Furthermore, the pattern of guilt perceived by intoxicated witnesses may have been influenced by traditional stereotypes concerning male/female aggressive behavior and concerning male IPV perpetrators/female IPV victims. A propensity to use stereotypes when ascribing guilt to the respective parties might be especially prominent among intoxicated witnesses due to their reduced cognitive capacities, resulting in increased heuristic processing and use of stereotypes. These proposed differences in perception and the possible causes proposed in the present thesis are the first of their kind, and therefore only tentative, but they converge with findings from solid lines of research on alcohol's effects on basic cognitive functioning.

In sum, the thesis shows that alcohol affects some, but not all, aspects of IPV witnesses' performance. The above outlined impact of alcohol on memory performance, on perception of aggression and on distribution of guilt may have important implications for improving how IPV cases are dealt with within the justice system as well as the health care system. Therefore, future studies should continue investigating this field, the goal being a better understanding of the multifaceted impact of alcohol on witnesses' testimonies regarding intimate partner violence.

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# Appendix

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- I. Hildebrand Karlén, M., Roos af Hjelmsäter, E., Fahlke, C., Granhag, P. A., & Söderpalm Gordh, A. (2014). Alcohol intoxicated eyewitnesses' memory of intimate partner violence. *Psychology, Crime and Law*, *21*, 156–171. doi: 10.1080/1068316X.2014.951644
  
- II. Hildebrand Karlén, M., Roos af Hjelmsäter, E., Fahlke, C., Granhag, P. A., & Söderpalm Gordh, A. (2015). Alcohol intoxicated witnesses: perception of aggression and guilt in intimate partner violence. *Journal of Interpersonal Violence*, doi: 10.1177/0886260515599656. pii: 0886260515599656. [Epublication ahead of print]
  
- III. Hildebrand Karlén, M., Roos af Hjelmsäter, E., Fahlke, C., Granhag, P. A., & Söderpalm Gordh, A. *When to interview intoxicated witnesses to intimate partner violence: when still drunk or when sober again?* Manuscript submitted for review.

