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DO SOBER EYEWITNESSES OUTPERFORM ALCOHOL INTOXICATED EYEWITNESSES IN A LINEUP?

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Abstract

Although alcohol intoxicated eyewitnesses are common, there are only a few studies in the area. The aim of the current study is to investigate how different doses of alcohol affect eyewitness lineup identification performance. The participants ($N = 123$) were randomly assigned to a 3 [Beverage: control (0.0 g/kg ethanol) vs. lower (0.4 g/kg ethanol) vs. higher alcohol dose (0.7 g/kg ethanol)] X 2 (Lineup: target-present vs. target-absent) between-subject design. Participants consumed two glasses of beverage at an even pace for 15 minutes. Five minutes after consumption the participants witnessed a film depicting a staged kidnapping. Seven days later, the participants returned to the laboratory and were asked to identify the culprit in a simultaneous lineup. The result showed that overall, the participants performed better than chance; however, their lineup performance was poor. There were no significant effects of alcohol intoxication with respect to performance, neither in target-present nor target-absent lineups. The study's results suggest that eyewitnesses who have consumed a lower (0.4 g/kg ethanol) or a higher (0.7 g/kg ethanol) dose of alcohol perform at the same level as sober eyewitnesses in a lineup. The results are discussed in relation to the alcohol myopia theory and suggestions for future research are made.

Keywords: alcohol intoxicated; eyewitness memory; person identification; lineup; alcohol myopia theory.

Resumen

Aunque los testigos presenciales con intoxicación alcohólica son frecuentes, sólo contamos con unos pocos estudios en esta área. El objetivo del presente estudio fue investigar cómo diferentes dosis de alcohol afectan la ejecución del testigo presencial en una rueda de identificación. Los participantes ($N = 123$) fueron asignados al azar a una de las condiciones de un diseño inter-sujetos 3 [Ingesta de alcohol: grupo control (0.0 g/kg etanol) vs. una dosis pequeña de alcohol (0.4 g/kg etanol) vs. una alta (0.7 g/kg etanol)] X 2 (Rueda de identificación: sospechoso presente vs. sospechoso ausente). Cinco minutos después de la ingesta, los participantes vieron una película que versaba sobre un secuestro. Siete días después, los participantes volvieron al laboratorio y se les pidió que identificaran al culpable en una rueda de identificación en formato de presentación simultáneo. Aunque la tasa de identificación era realmente pobre, los resultados mostraron que, en general, los testigos identificaban por encima al azar. No se encontró un efecto significativo del alcohol en la ejecución, tanto en ruedas como con el sospechoso presente como ausente. Estos resultados sugieren que los testigos presenciales que han consumido una tasa baja (0.4 g/kg etanol) o alta (0.7 g/kg etanol) de alcohol rinden al mismo nivel en una rueda de identificación que testigos sobrios. Se discuten los resultados en relación con la teoría de la miopía del alcohol y se sugieren futuras líneas de investigación.

Palabras clave: intoxicación alcohólica; memoria de testigos; identificación de personas; rueda de identificación; teoría de la miopía por alcohol.

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Introduction

Alcohol related crimes are common in western society, meaning that the offender, victim or eyewitness is intoxicated at the time of the crime. For instance, in one survey, more than 70% of American law enforcement officers reported that it was common or very common to be in contact with intoxicated eyewitnesses, and approximately 20% had conducted a lineup with a witness who had been intoxicated at the time of the crime (Evans, Schreiber Compo, & Russano, 2009). Considering that the alcohol consumption in many western countries has increased during recent years, it is likely that alcohol related crimes will continue to rise (Swedish Council for Information on Alcohol and other Drugs, 2008). Despite the prevalence of alcohol related crimes, there is a considerable lack of research on the specific effects of alcohol on eyewitness memory. Therefore, the present study examined how alcohol affects eyewitness ability to identify the culprit in a lineup.

This research is important considering the significance of eyewitnesses in many criminal cases. Identifying the culprit is a difficult task, and errors may occur (Sharps, Janigian, Hess, & Hayward, 2009). For example, studies have found that approximately 75% of wrongful convictions have been due to erroneous eyewitness identifications (Wise, Pawlenko, Safer, & Meyer, 2009). Many criminal cases lack technical evidence, making eyewitnesses an important source of information. Alcohol-related crimes and intoxicated eyewitnesses are common and there is a lack of research and standard procedures on how the legal system should value the accuracy of a lineup identification made by an intoxicated eyewitness (Evans et al., 2009; Malpass et al., 2008). Knowledge about how alcohol affects eyewitness memory may help the police in their practical work and is therefore important.

Alcohol disturbs cognitive functions (Giancola & Corman, 2007) including memory. Alcohol intoxication affect all stages of the encoding process, but primarily the transition of temporary memories from short term memory to the long term memory (Mintzer, 2007). Alcohol-induced blackout is caused by a rapid consumption of alcohol which leads to a high blood alcohol concentration (BAC). The level of the blackout can vary to either a total memory loss (blackout) or more commonly, a fragmentary loss (grayout) from the time of intoxication (Lee, Roh, & Kim, 2009).

One theory of relevance is the alcohol myopia theory, which suggests that intoxicated individuals are cognitively impaired such that they cannot a) pay attention to

as many stimuli as sober counterparts, and/or b) understand the stimuli to a full extent. This leads to that a smaller amount of information is encoded compared to sober individuals. For this reason it is thought that intoxicated individuals will tend to encode mostly central details, at the expense of peripheral ones (Josephs & Steele, 1990; Steele & Josephs, 1990). Several studies support the alcohol myopia theory (e.g., Clifasefi, Takarangi, & Bergman, 2006; MacDonald, MacDonald, Zanna, & Fong, 2000; Schreiber Compo et al., 2011), while others do not (e.g., van Oorsouw & Merckelbach, 2012). It has therefore been proposed that intoxicated eyewitnesses will have enough central information about the culprit to make a correct identification in a target-present lineup (TP condition), with comparable accuracy to sober eyewitnesses. However, due to their inferior encoding of peripheral information, intoxicated eyewitnesses' ability to distinguish a culprit from a foil may be impaired, making them less likely to reject a target- absent lineup (TA condition), compared with sober individuals (Dysart, Lindsay, MacDonald, & Wicke, 2002).

To our knowledge, there are only two published studies on the effects of alcohol on eyewitness lineup performance. In a study by Yuille and Tollestrup (1990), participants were divided into one of three groups; experimental (alcohol), control or placebo. The alcohol group received three drinks, with a 30 minute consumption period. The alcohol dose was 1.32 ml/kg and resulted, 20 minutes after consumption, in a BAC ranging between 0.06- 0.12%, with a mean of 0.10%. All participants then watched a staged theft in an office. One week later, they were asked to identify the culprit in a simultaneous lineup. The response alternative was forced choice (e.g., the culprit is number X or a *not there* response). The results showed that alcohol intoxication did not have an effect on identification accuracy, either in the TP condition or the TA condition. Although not significant, the intoxicated participants made more foil identifications in the TA condition compared to the control groups, giving partial support for alcohol myopia theory.

Dysart et al. (2002) recruited participants in a bar. Those who agreed to participate were taken to a separate room and BAC measurements were taken. Participants who had a lower blood alcohol level had a BAC that ranged from 0.00% to 0.04% with a mean of 0.02% ($SD = 0.02\%$). In the high blood alcohol level group, participants' BAC ranged from 0.04% to 0.20% with a mean of 0.09% ($SD = 0.04\%$). Each participant was then asked to identify the recruiter in a show-up (single photo), with a retention interval of only a few minutes. The response alternative was

dichotomous (yes or no response). It was found that the level of intoxication did not have a significant effect on performance in the TP lineup, but as the level of intoxication increased, participants in the TA lineup made fewer rejections, which gives support for alcohol myopia theory.

Additional variables examined in the present study were confidence ratings and sex. Eyewitnesses who are confident in their lineup decision have sometimes been found to make more correct identifications of the culprit than eyewitnesses who are less confident (e.g., Brewer, Weber, Clark, & Wells, 2008). The effects of alcohol on eyewitness confidence has, however, produced equivocal results (compare Yuille & Tollestrup, 1990 with Dysart et al., 2002), begging the need for further research. With respect to sex differences, women have been found to outperform men in face recognition tasks, especially if the face seen is another woman (Lovén et al., 2012; Lovén, Herlitz, & Rehnman, 2011). Moreover, alcohol may affect memory differently for men and women (Mumenthaler, Taylor, O'Hara, & Yesavage, 1999). It is unknown whether a sex difference also occurs when the event in question is something that may affect arousal levels, for example a crime event (Colley, Ball, Kirby, Harvey, & Vingelen, 2002; Lindholm & Christianson, 1998). The studies in the alcohol and lineup area has either not found any sex differences (Dysart et al., 2002), or not analyzed sex differences (Yuille & Tollestrup, 1990).

An eyewitness lineup choice depends on the match between the faces in the lineup and the eyewitness' memory of the culprit's face (Clark, 2003). Previous research on alcohol intoxicated eyewitnesses has used either a forced or dichotomous lineup response, which may lead to a higher number of false identifications than in a real life setting. New research has shown that both eyewitnesses with a poor memory of the culprit, and eyewitnesses with a good memory, can be uncertain and benefit by the inclusion of a *don't remember* (or *not sure*) response alternative during the lineup. Including such a response option may, for example, decrease the number of false identifications and moderate the outcome of the lineup (Steblay & Phillips, 2011; Weber & Perfect, 2011).

In order to reduce the gap in knowledge as discussed above, the present study was designed to examine how alcohol affects eyewitness ability to identify the culprit in a lineup, in both target-present and target-absent conditions. The current study advances previous research on several accounts. First, two different doses of alcohol were used, a lower (0.4 g/kg ethanol) and a higher alcohol dose (0.7 g/kg ethanol) in a controlled

laboratory environment. These doses are often referred, in alcohol research experiments, to as a lower to moderate level of alcohol intoxication (e.g., Dougherty, Marsh, Moeller, Chokshi, & Rosen, 2000; Holdstock, Penland, Morrow, & de Wit, 2006; King, Houle, de Wit, Holdstock, & Schuster, 2002). Second, with the aim of increased ecological validity, the stimulus material was a film showing a staged violent kidnapping, with a scene where the culprit pointed a weapon towards the witness. Third, as suggested by previous research (Steblay & Phillips, 2011; Weber & Perfect, 2011) a *not sure* response was included. A fourth aim was to examine how alcohol affects eyewitness lineup performance with respect to sex.

In line with the alcohol myopia theory, it was hypothesized that in the target-present condition, blood alcohol concentration would not have a significant effect on lineup performance (Hypothesis 1). In the target-absent condition, a higher degree of alcohol intoxication was expected to result in a poorer lineup performance (Hypothesis 2).

Method

Participants

The participants were non-problem social drinkers recruited through announcement boards at the University of Gothenburg, Sweden. Of the total number of participants ($N = 133$) at the first session, 10 did not conduct the lineup one week later. The statistical analyses were performed on data from the participants who completed the follow up ($N = 123$, 60.2% women and 39.8% men). The participants were distributed over a) a control group ($N= 41$), b) a lower alcohol dose group ($N = 42$) and c) a higher alcohol dose group ($N = 40$). The proportion of men and women did not differ between the three groups, $\chi^2(2, N = 123) = 2.19$, *ns*. The participants were students (97.6 % Caucasian) with a mean age of 25.07 ($SD = 3.45$) and mean weight of 69.98 kg ($SD = 12.61$).

Design

Participants were randomly assigned to a 3 (Beverage: 0.0 g/kg ethanol [i.e. control] vs. 0.4 g/kg ethanol [i.e. a lower alcohol dose] vs. 0.7 g/kg ethanol [i.e. a higher alcohol dose]) x 2 (Lineup: target-present vs. target-absent) between-subject design. The dependent measures were lineup performance and confidence ratings.

Materials and measures

Laboratory environment

The study took place in a laboratory located at the Addiction Biology Unit (Section of Psychiatry and Neurochemistry, Institute of Neuroscience and Physiology), of the Sahlgrenska Academy at the University of Gothenburg (Sweden). It is an established laboratory for clinical alcohol experiments and is furnished and decorated as a living room (with couch, chairs, table, lamps, window, curtain, paintings and TV), in order to create a relaxed environment. During the experiment phase the participants were not allowed to use tobacco or to use their mobile phones, music players, laptops, watch TV, or to study or read magazines. All participants had the same viewing distance to the large TV screen, approximately 3 to 4 meters.

Beverage

Alcohol (Absolute Vodka 40%) was mixed with orange juice (pulp free). The target alcohol doses were 0.4 g/kg ethanol and 0.7 g/kg ethanol; this means that the doses were adjusted for body weight. The target BAC was 0.04% and 0.07%, which is above the Swedish legal driving limit at 0.02%. This degree of intoxication typically results in behavior changes such as extraversion, joyfulness, and talkativeness, but also cognitive impairments of concentration, reasoning, perception, and peripheral vision. The participants in the alcohol groups knew that they were consuming alcohol, but they were unaware of whether they received the lower or higher alcohol dose. The control group knew that they only received orange juice and this was administrated in the same volume as the total amount of liquid that the higher alcohol dose group received. The beverage in all groups was served cold in two glasses with a total consumption time of 15 minutes (7 minutes and 30 seconds per glass).

Objective measure

The objective measure was breath alcohol concentration (BAC). The BACs were estimated from blood alcohol level (BAL) using the portable breathalyzer Alert J5 (Alcohol Countermeasure Systems Corp, 2006). One breathalyzer was used for each session and was calibrated when necessary. The objective measure was taken while participants were seated.

Subjective measure

The Biphasic Alcohol Effects Scale (BAES) (Martin, Earleywine, Musty, Perrine, & Swift, 1993) was used to measure the subjective effect of alcohol. The BAES is a 14-item adjective rating scale consisting of two subscales that measure the stimulative and sedative effects of alcohol. The participants rated the extent to which they experienced each adjective on a 100-point scale from "not at all" (0) to "extremely" (100). Each participant's ratings were later combined into two measures: one stimulative (summing scores for the adjectives "elated", "energetic", "excited", "stimulated", "talkative", "up" and "vigorous") and one sedative (summing scores for the adjectives "down", "heavy head", "inactive", "difficulty concentrating", "sedated", "slow thoughts" and "sluggish"). The BAES scale has good psychometric properties that correspond to the ascending and descending limb of the blood alcohol curve (see: Söderpalm-Gordh & Söderpalm, 2011).

Stimulus event

The stimulus event consisted of a film, shot from the perspective of an eyewitness who sees two men kidnapping a woman at a bus stop. The film lasted 4 minutes and 50 seconds, with both culprits and the victim filmed from various angles. Close views of the main culprit's face were available for 31 seconds, the other culprit's face for 14 seconds, and the victim's face for 53 seconds. The film has been used in a number of previous studies (e.g., Allwood, Ask, & Granhag, 2005; Allwood, Granhag, & Jonsson, 2006; Granhag, 1997).

The identification task

The lineup was simultaneous and presented via a computer monitor. This presenting method has been used in previous research (e.g., Lindsay, Semmler, Weber, Brewer, & Lindsay, 2008; Sauer, Brewer, & Wells, 2008) and has several advantages, for instance double blind administration. Double blind administration has been shown to be very important in order to not influence the witness decision (Rodriguez & Berry, 2012). The lineup was constructed and presented using the online survey software program Unipark. In order to achieve high ecological validity, the retention interval between the crime and the lineup was set to seven days, which has been used in one previous study about alcohol intoxicated eyewitnesses lineup performance (see Yuille & Tollestrup, 1990).

The lineup consisted of three consecutive separate pages; instructions, the identification task, and confidence ratings. The unbiased instructions explained the task to identify the main culprit (the man with the gun in the film) from photos. In line with lineup guidelines there was also a warning that "*a photo of the culprit may or may not be present in the lineup*". The simultaneous lineup consisted of eight color photos. Seven photos were of foils and one photo of the culprit (target-present condition) or the culprit's replacement (target-absent condition). Foils consisted of color photos of inmates and were downloaded from the Arkansas Department of Corrections Web site and from Florida's Department of Corrections Web site, which also previous researchers has done (Zarkadi, Wade, & Stewart, 2009). The photos provided a front view of the foils from the chest up and were edited by a professional photographer in order to be similar in terms of size (6.5 cm x 7.1 cm), background, and sharpness. Both foils and target replacement were chosen, by the main authors, in order to be of average similarity in physical appearance to the culprit with regard to age, sex, ethnicity, glasses and hairstyle. The position of the target and the target replacement was varied randomly to appear an equal number of times at all eight positions in the lineup. Under the photos, the following question was posed; "*Is the culprit present in the photos shown above?*" The response alternatives were "*Yes*" and then the number of the photo, "*No, the culprit is not present*", and "*Do not remember*". Following this, the participants were required to explain in their own words how they had reached their decision. The third and final page asked the participants to rate how confident they were about the correctness of their decision. The scale was an 11 point likert scale which ranged from 1 (*Not at all confident*) to 11 (*Completely confident*). The participants expressed their confidence by clicking on one of the 11 on-screen buttons. Participants who had provided a *don't remember* answer did not view the confidence rating scale page.

Procedure

Recruitment and screening of participants

The participants were screened for initial eligibility by a research nurse via telephone. Potential participants were invited to the laboratory for a physical examination by a medical doctor. They also completed the Psychiatric Symptom Checklist (Derogatis, 1983) and the Alcohol Use Disorder Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). A health questionnaire with sections about current and lifetime drug was used. This questionnaire was a Swedish

adoption of an already existing questionnaire (Currie, Hurrelmann, Settertobulte, Smith, & Todd, 2000; Hibell et al., 2004; Hibell et al., 1997). The Swedish version has been used in previous alcohol research (e.g., Söderpalm-Gordh & Söderpalm, 2011). Participants were excluded from the study if they had any ongoing medical condition requiring medication, any ongoing Axis 1 psychiatric disorder (American Psychiatric Association, 2000), or any history of psychosis, history of illicit drug or alcohol abuse or dependence, less than a high school degree, lack of fluency in Swedish, or night shift work. Participants with current harmful alcohol drinking habits (AUDIT total score > 10) were excluded, as were participants with abnormal body weight (body mass index: < 19 or > 26), as well as pregnant or nursing women. Participants were accepted without regard to race or ethnicity. Before participation, participants were informed that the aim of the study was to investigate how alcohol affects eyewitness memory. A research nurse answered any questions the participants had before they signed the formal written consent. Participants were told that they may be assigned to either the alcohol or the control condition. They were also instructed to eat before arrival to the laboratory. The financial compensation for participation was a choice of either 350 SEK (approximately 40 Euros) or three cinema tickets. The study was approved by the Regional Ethical Review Board in Gothenburg, Sweden.

Phase 1: The event

Participants arrived at the laboratory approximately at 13.00 hours. Upon arrival to the laboratory, participants were informed about the procedure. Baseline BAC and subjective self-report (BAES) was measured. Each experiment session normally consisted of groups of three to four participants, but the number could vary between two to six participants. All participants in one session were administrated the same beverage and dose. The experiment started when the participants consumed the beverage containing 0.4 g/kg ethanol, 0.7 g/kg ethanol or juice only. The consumption was monitored by the experiment leader to ensure an even ingestion pace over the 15 minutes. Five minutes after consumption had stopped (20 minutes after start of consumption); the participants were expected to have reached their peak BAC. They then witnessed the staged kidnapping on film. The participants were instructed not to talk with each other about the film. After the film (35 minutes after start of consumption), the participants completed filler tasks for 25 minutes, before being briefly asked, individually, about the film in a separate room by an interviewer who was

blind to the participant's level of intoxication. This was meant to mirror a situation where the police conduct brief questioning at the scene of the crime, in order to find important eyewitnesses appropriate for further interviewing. The brief questioning was not analyzed in this study.

BAC and subjective mood effects were measured before consumption and 20, 35 and 50 minutes after the start of the beverage consumption. The participants were not told about the level of the BAC measure, either during or after the experiment. 65 minutes after start of beverage intake, the last BAC measurement was taken and the experiment phase ended and the control group was sent home. Alcohol intoxicated eyewitnesses remained at the lab the following hours, until completely sober (BAC = 0.00) and were then sent home.

Phase 2: The identification task

After a retention interval of one week, the participants returned to the laboratory for a follow up in a sober state. The participants were, upon arrival, unaware about the lineup task and knew only that there would be some questions concerning the first session. The lineups were administered to participants individually, in a room they had not visited previously, by an administrator blind to the dose and to the TP and TA condition in the lineup. After the lineup, they were interviewed about the witnessing of the crime. Data from the interviews are not analyzed in the present study. After completion, the participants received the financial compensation for their participation.

Data analysis

All statistical tests were conducted using SPSS version 18 for Windows. When appropriate, Pearson's chi square test where used and when cells had an expected count less than five, an exact significance test was selected and reported as exact *p*. In other cases Analysis of Variance (ANOVA) with the Bonferroni correction was used.

Results

Manipulation check

Objective measure

Figure 1 illustrates the variation of BAC over the experiment. At the time of witnessing the kidnapping, the participants' BAC ranged from 0.00 to 0.09 and there was a significant main effect of alcohol dose on the participants' actual BAC, $F(2, 120) = 150.11$, $p < .001$. The post hoc test with Bonferroni correction ($.05/3 = .017$) showed that BAC differed significantly between control group ($M = 0.00$, $SD = 0.00$) and lower alcohol dose group ($M = 0.04$, $SD = 0.02$). The control group also differed from the higher alcohol dose group ($M = 0.06$, $SD = 0.02$), and there was a difference between the lower ($M = 0.04$, $SD = 0.02$) and higher alcohol dose groups ($M = 0.06$, $SD = 0.02$). This shows that the alcohol manipulation had the intended effect at the time of witnessing the film.

Figure 1. Mean BAC of the Control Group, Lower and Higher Alcohol Dose Groups at Start of Beverage Consumption (0 Minutes), at 20 (Witnessing Staged Kidnapping on Film), 35, 50 and 65 Minutes after Start of Consumption.
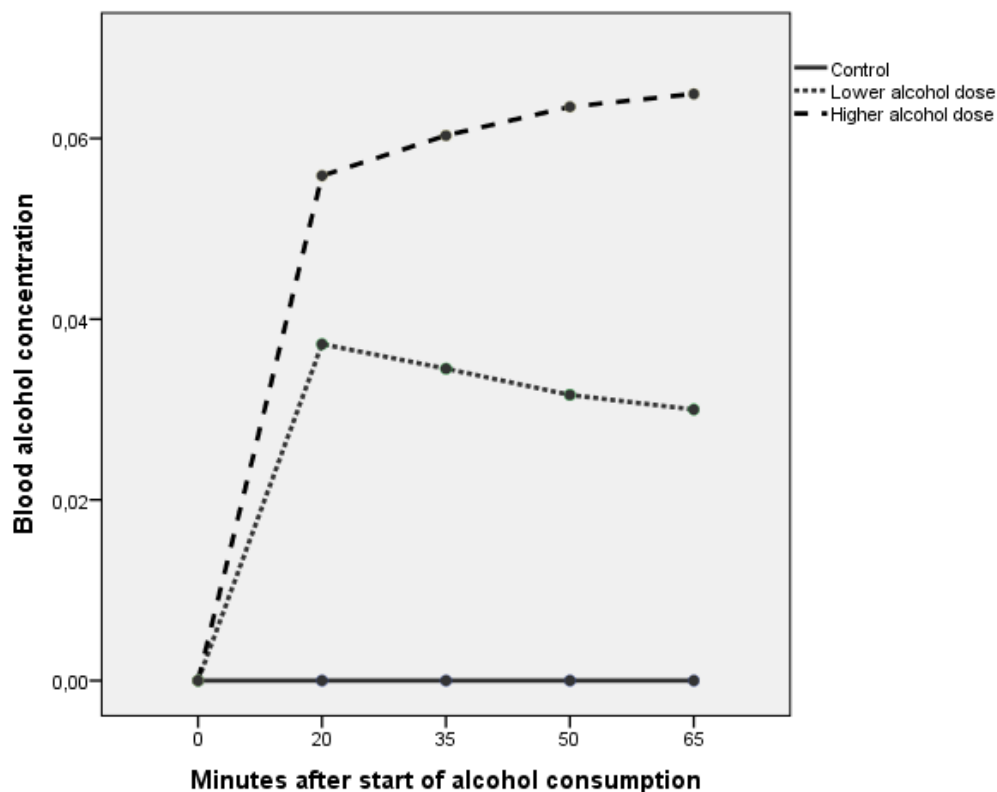
Subjective measure

By the time when the staged kidnapping was shown, the participants reported a stimulative effect of alcohol (see Figure 2), while they did not yet experience a large sedative effects (Figure 3). This means that the participants were still alert when they witnessed the kidnapping. The figures illustrate how the stimulant and sedation effect of the alcohol developed over the experiment time which can be compared to the changes in BAC in Figure 1. At the time of witnessing the staged kidnapping, there was a significant effect of alcohol dose on the stimulant scale of the BAES, $F(2, 116) = 5.39$, $p < .01$ (see Figure 2). A post hoc with Bonferroni correction showed a significant difference between the control group ($M = 32.02$, $SD = 8.64$) and the higher alcohol dose group ($M = 39.64$, $SD = 11.76$), with the higher alcohol dose group experiencing more stimulation. There was no significant difference in stimulation between the participants in the control group ($M = 32.02$, $SD = 8.64$) and the lower alcohol dose group ($M = 37.21$, $SD = 10.96$), or between the lower ($M = 37.21$, $SD = 10.96$) and higher alcohol dose groups ($M = 39.64$, $SD = 11.76$). There was no significant main effect of alcohol dose on the sedation scale of the BAES, $F(2, 116) = 1.97$, *ns,* at the time of witnessing the film, control group ($M = 16.78$, $SD = 7.49$), lower alcohol dose group ($M = 20.86$, $SD = 10.61$) and higher alcohol dose group ($M = 20.08$, $SD = 11.27$) (see Figure 3).

Figure 2. Mean Value on the Stimulant Scale of the BAES of the Control Group, Lower and Higher Alcohol Dose Groups at Start of Beverage Consumption (0 Minutes), at 20 (Witnessing Staged Kidnapping on Film), 35 and 50 Minutes after Start of Consumption.
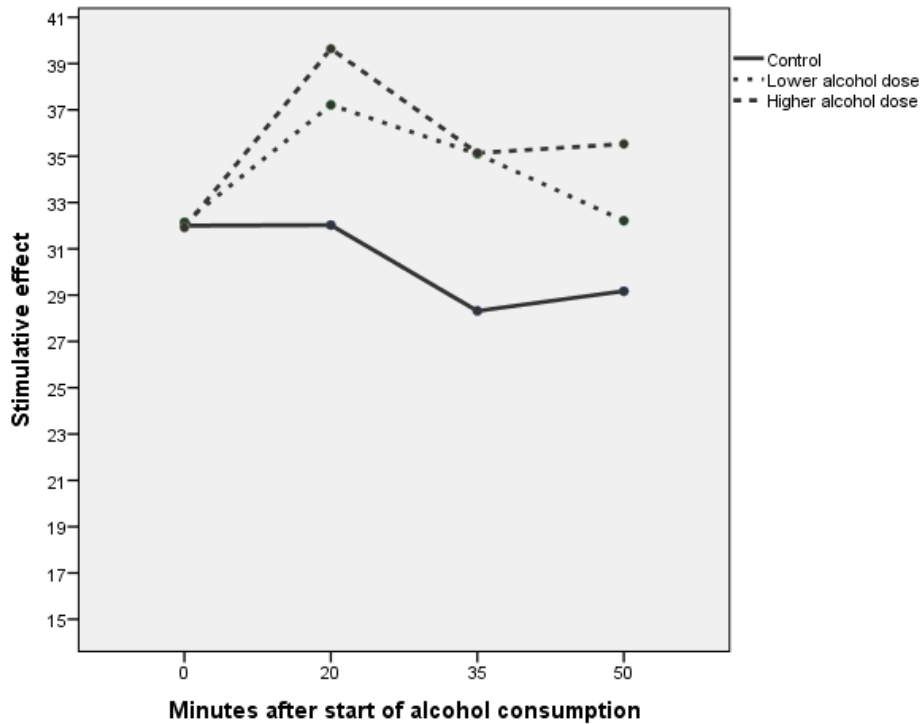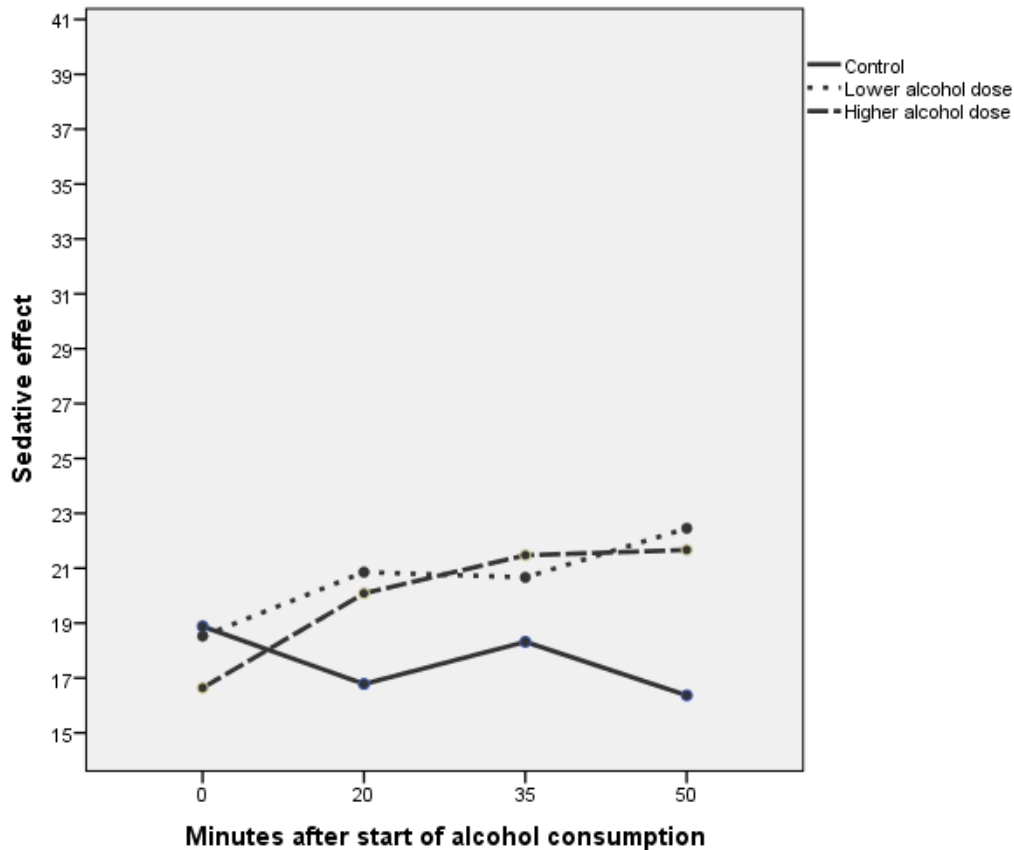

Note. Higher values illustrate a stronger stimulative effect of alcohol.

Performance level

Overall

The chance to identify the culprit, by guessing, in an 8 person simultaneous target-present lineup with a *He is not there* response alternative was 11.1% (1/9 = 11.1%, with the response alternative *Do not remember* excluded). Similarly, the probability to correctly reject a target-absent lineup, by guessing, with 9 response alternatives (8 foils, one *He is not there* response) was 11.1%. The overall main performance level (the total number of participants that correctly identified the culprit in target-present or correctly rejected the lineup in target-absent) across all groups combined was 42.9%, which was significantly above the level of chance at 11.1%, $\chi^2(1, N = 84) = 85.71, p < .001$.

Figure 3. Mean Value on the Sedation Scale of the BAES of the Control Group, Lower and Higher Alcohol Dose Groups at Start of Beverage Consumption (0 Minutes), at 20 (Witnessing Staged Kidnapping on Film), 35 and 50 Minutes after Start of Consumption.

Note. Higher values illustrate a stronger sedative effect from alcohol.

Target-present

Participants in the control group performed significantly better (38.5%) than chance (11.1 %), $\chi^2(1, N = 13) = 9.85$, exact $p < .010$. The lower alcohol dose group performed at chance level (6.7 %), $\chi^2(1, N = 15) = 0.30$, *ns,* and the higher alcohol dose group performed significantly better (47.1 %) than chance, $\chi^2(1, N = 17) = 22.24$, exact $p < .001$[1].

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[1] A separate analysis on performance in relation to chance level was made for the participants who made an identification (either correctly identified the culprit, or identified a foil), excluding those who gave a *not there* and a *do not remember response*. This analysis showed the same results as the above analysis, the control group and higher alcohol dose group significantly performed above chance level, but not the lower dose group.

Target-absent

In the target-absent condition, participants in all three groups performed better than the 11.1% expected by chance: control group, 41.7%, $\chi^2(1, N = 12) = 11.34$, exact $p < .01$; lower alcohol dose group, 72.7%, $\chi^2(1, N = 11) = 42.28$, exact $p < .001$; and higher alcohol dose group, 56.3%, $\chi^2(1, N = 16) = 33.01$, exact $p < .001$.

Main results: The effect of Alcohol on Lineup Performance

Target-present

There was no significant difference, $\chi^2(6, N = 60) = 9.65$, *ns*, between participants in the three groups in terms of lineup performance (see Table 1). After screening out participants with a *do not remember* response ($N = 15$), there was still no difference between the groups, $\chi^2(4, N = 45) = 7.34$, *ns*. When the participants who rejected the lineup were also excluded (i.e. only including participants who correctly identified the culprit versus those who identified a foil), there was no significant difference between the groups in lineup performance, $\chi^2(2, N = 25) = 6.87$, *ns*.

Table 1. Percentages (and Frequencies) of Participants' Responses in the Target-Present Lineup.

Target-present	Control group (*N* = 20)	Lower alcohol dose group (*N* =20)	Higher alcohol dose group (*N* = 20)
Correct identification	25.0% (5)	5.0% (1)	40.0% (8)
Foil identification	10.0% (2)	30.0% (6)	15.0% (3)
Incorrect rejection	30.0% (6)	40.0% (8)	30.0% (6)
Do not remember response	35.0% (7)	25.0% (5)	15.0% (3)

Target-absent

No significant difference was found between participants in the groups, $\chi^2(4, N = 63) = 6.24$, *ns* (see Table 2). Also, after screening out participants with a *do not remember* answer ($N = 24$), chi-square test showed no significant difference between the groups, $\chi^2(2, N = 39) = 2.25$, *ns*.

Table 2. Percentages (and Frequencies) of Participants' Responses in the Target-Absent Lineup.

Target-absent	Control group (*N* = 21)	Lower alcohol dose group (*N* = 22)	Higher alcohol dose group (*N* = 20)
Correct rejection	23.8% (5)	36.4% (8)	45.0% (9)
Foil identification	33.3% (7)	13.6% (3)	35.0% (7)
Do not remember response	42.9% (9)	50.0% (11)	20.0% (4)

Confidence rating

The following analysis was performed on participants, who had made an identification of some kind in the lineup, hence the participants who answered *I do not remember* never made any confidence rating about their lineup decision. With regard to confidence of the witnesses lineup choice, there were no significant differences between the control group ($N = 25$, $M = 7.08$, $SD = 2.16$), lower ($N = 26$, $M = 7.50$, $SD = 1.50$) and higher alcohol dose group ($N = 33$, $M = 7.27$, $SD = 1.76$), when both the TP and TA condition was merged to one category, $F(2, 81) = 0.34$, *ns*. When separated for lineup condition, in the TP condition there was no difference in confidence between participants in the control group ($N = 13$, $M = 6.69$, $SD = 1.93$), lower alcohol dose group ($N = 15$, $M = 7.20$, $SD = 1.15$), and higher alcohol dose group ($N = 17$, $M = 7.12$, $SD = 1.22$), $F(2, 42) = 0.49$, *ns*. The same pattern was found in the TA condition, with no difference in confidence between participants in the control group ($N = 12$, $M = 7.50$, $SD = 2.39$), lower alcohol dose group ($N = 11$, $M = 7.91$, $SD = 1.87$) and higher alcohol dose group ($N = 16$, $M = 7.44$, $SD = 2.22$), $F(2, 36) = 0.17$, *ns*.

Sex differences

There were no significant differences between women and men concerning lineup performance in the TP condition, $\chi^2(3, N = 60) = 1.92$, *ns*, or in the TA condition, $\chi^2(2, N = 63) = .812$, *ns*.

Discussion

The present study investigated whether different doses of alcohol had an effect on lineup performance. The manipulation check showed that the eyewitnesses were

alcohol intoxicated (measured objectively by a breathalyzer), and they were also feeling stimulated by the alcohol at the time of witnessing the crime (measured by the subjective BAES).

In relation to the identification accuracy, there was no difference between participants in the three groups in terms of lineup performance in the TP condition (supporting Hypothesis 1), which is consistent with a previous study (Yuille & Tollestrup, 1990). The present result held true even when excluding those participants who gave a *do not remember answer* and never made a lineup choice. This analysis was motivated by the new direction in lineup research which has shown that it is important to have a *do not remember* response alternative in order to screen out eyewitnesses who are unsure and to increase lineup accuracy (Steblay & Phillips, 2011; Weber & Perfect, 2011). If the *do not remember* response alternative had not been available, it is likely that more participants would have identified a foil, and also that more eyewitnesses would have made correct identifications by guessing. In our study, over both lineup conditions, 31.7% of the participants gave a *do not remember* response and in the TP condition 25.0% gave this response. The high frequency of *do not remember* responses reflects reality in highlighting the difficulties eyewitnesses have in judging whether the culprit is present or not, and who it might be. The result is similar to previous research which had 27.0% *not sure* responses in a TP lineup (Steblay & Phillips, 2011). One study showed that 19.3% of the participants gave a *not sure* response when this response alternative was explicit, but only 2.2% of the participants came up with this response on their own when it was not provided (Weber & Perfect, 2011).

For the TA condition, no significant difference was found between the groups with respect to lineup performance, thus Hypothesis 2 was not supported. The results correspond to a previous study with similar design (Yuille & Tollestrup, 1990). A large amount (38.1%) of eyewitnesses gave a *do not remember* response in our study and no differences between the groups were found when these participants were excluded from the analyses. Even though there were no significant differences between the groups, the performance levels were better than chance.

Overall, in the TP condition and the TA condition, all groups, except for the lower dose in the TP condition, performed significantly better than chance. Nonetheless, despite that the performance level was above chance, the identification rate of the culprit was poor. In previous research, there is a wide range between studies in how well eyewitnesses perform in a lineup task, which may be due to for example

differences in stimuli, designs, and retention intervals. Two meta-analyses showed that approximately 50% of participants succeed in identifying the culprit in the TP condition (Steblay, Dysart, Fulero, & Lindsay, 2001; Steblay, Dysart, & Wells, 2011), but the range varies considerably. Some studies, including the present, have an identification rate in the lower range of approximately 25% (Brewer et al., 2008), while other studies have an identification rate of 90% (Yuille & Tollestrup, 1990). In the TA condition, meta-analysis has shown that the rate for correct rejection is 43-49% (Steblay et al., 2001; Steblay et al., 2011), and the current outcome is in the lower part of the range, while other studies are above with a correct rejection rate of 60-75% (Brewer et al., 2008; Yuille & Tollestrup, 1990). In a practical context, it is important to remember that eyewitnesses' performance level varies considerably, making it difficult to determine eyewitness accuracy in a certain case.

According to the alcohol myopia theory (Josephs & Steele, 1990; Steele & Josephs, 1990), central features and stimuli will be encoded to the same degree among intoxicated and sober individuals. From this one could infer that intoxicated eyewitnesses will be able to identify the culprit in the TP condition to the same extent as sober eyewitnesses. The alcohol myopia theory also predicts that non central details will be more poorly encoded among intoxicated individuals and one could therefore assume that intoxicated eyewitnesses will be comparatively more likely to conclude that a similar looking foil is the culprit in the TA condition. The results of the study by Dysart et al. (2002), which used a show-up immediately after a non-criminal event, supported this theory. The results from the current study and that by Yuille and Tollestrup (1990), who both used a simultaneous lineup one week after an event, showed support for the alcohol myopia in the TP condition, but not in the TA condition. The different results may be due to different levels of BAC between the studies. The participants' BAC in the present study was approximately in the same range (0.00-0.09%) as in study by Yuille and Tollestrup (1990) (0.06-0.12%) and both studies support the alcohol myopia theory in the TP condition, but not in the TA condition. In the study by Dysart et al. (2002), BAC ranged from 0.00 to 0.21%, meaning that some participants were more intoxicated than participants in the other two studies. This higher alcohol intoxication level may be one factor explaining the support for the alcohol myopia theory. However, it is important to highlight that the study by Dysart et al. (2002) also used a different design and method (e.g., immediate show-up and no criminal event) and the participants had a live target and were not asked to focus their attention on a specific film, as in our

study, where the whole film may have been perceived as a central stimulus. Although not significant, the study by Yuille and Tollestrup (1990) showed that the intoxicated eyewitnesses made more foil identifications in the TA condition compared to the eyewitnesses in the control group. In our study, the level of foil identification in the TA condition was approximately the same in the control and higher alcohol dose group (see Table 2), which does not give support to the alcohol myopia theory. Overall, in the context of simultaneous lineup identifications one week after an event, the prediction of the alcohol myopia theory seems to hold for the TP condition, but not for the TA condition. Thus, more studies are needed to examine to what extent the alcohol myopia theory holds true for lineup contexts.

As for limitations and suggestions for future studies, this study was conducted in a laboratory with a staged crime shown on a TV screen with students as participants. Such an experimental setting carries some obvious limitations (Chae, 2010). For example, in real life crime situations, it is likely that the level of arousal is affected, and thus future studies should examine the effects of alcohol intoxication in situations with higher arousal.

Moreover, the participants in the present study were high functioning university students who had been included in the study after passing both medical and psychological examinations. They may have had expectations about the study and tried to be alert and sharpen their focus in order to perform well, which may have reduced the difference between intoxicated and sober participants. Since long term memory declines with increasing age (Bartlett, Leslie, Tubbs, & Fulton, 1989; Park & Gutchess, 2004), the generalizability of the present results are limited to younger eyewitness, and further studies may investigate how alcohol also affects older eyewitnesses' lineup performance.

Even though the overall performance level in the lineups was above chance, the performance was poor for all groups, which may be due to several factors. Although the film was realistic in the sense that there were several characters involved (two culprits, one victim and some bystanders), this may have affected the identification performance negatively due to divided attention (Chae, 2010; Palmer, Brewer, McKinnon, & Weber, 2010). Furthermore, there was a slight discrepancy between the culprit's appearances in the film and in the lineup. This coupled with the weeklong retention interval may also help explain the poor identification rates. However, whether such aspects should be seen

as limitations is debatable, as they reflect likely difficulties faced by real life eyewitnesses, highlighting how difficult lineup identification situations are.

Future research may test the impact of a higher dose of alcohol on lineup performance, in order to see if the alcohol myopia theory is more suitable with a higher intoxication level. It is possible that the present study failed to reveal significant differences between the groups because the higher alcohol dose used in our study was actually too low to cause a true alcohol induced myopic state. Another important question is if alcohol has an impact on the amount of details eyewitnesses are able to report at a recall task. Some previous studies have shown that intoxicated eyewitnesses have a poorer recall compared to sober eyewitnesses (Schreiber Compo et al., 2011; Yuille & Tollestrup, 1990).

In conclusion, previous research has shown that eyewitnesses are discredited in court if they were intoxicated at the time of witnessing the crime (Evans & Schreiber Compo, 2010). Nonetheless, the present study showed that the intoxicated eyewitnesses performed on the same level as their sober counterparts and although the performance level was above chance, it is important to note that the actual performance levels in the present study were rather poor, both for the sober and intoxicated eyewitnesses. At present, it is too early to draw conclusions about the impact of alcohol intoxication on eyewitnesses' identification ability, thus more studies in this field are recommended.

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