RUNNING HEAD: RECONSTRUCTING ALCOHOL BLACKOUTS

# Reconstructing alcohol-induced memory blackouts

Robert A. Nash[1] & Melanie K. T. Takarangi[2]

[1]University of Surrey, UK

[2]University of Leicester, UK

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Corresponding author:
Robert A. Nash
Department of Psychology
University of Surrey
Guildford, Surrey, GU2 7XH
United Kingdom

Email: R.Nash@surrey.ac.uk
Tel: 01483 686884

## Abstract

Many people who drink alcohol have experienced a *blackout*; whereby they are unable to recall events that occurred during a period of intoxication. Following these blackout episodes, individuals may attempt to reconstruct what happened to them. Blackouts therefore afford an excellent opportunity to study the strategies people use to reconstruct forgotten experiences. We conducted a survey of college students to explore how people choose to reconstruct blackouts, and the likely accuracy of these reconstructions. Our findings add to the growing research literature on people's strategies for validating their past experiences, and highlight the important role of external sources in the reconstruction process. The data show that people's desire to 'fill in the blanks' can lead them to rely on rather unreliable sources, and may also encourage them to adopt weaker source monitoring criteria. Indeed, in at least some cases, reconstructing blackouts appears to lead to the development of false beliefs or memories.

# Reconstructing alcohol-induced memory blackouts

Colleges and universities teem with amnesiacs, of a sort. Around half of college students report having experienced alcohol-induced memory blackouts; that is, amnesia for periods of time during which they were intoxicated (Buelow & Koeppel, 1995; White, Jamieson-Drake, & Swartzwelder, 2002). Yet despite the ubiquity of alcohol blackouts, we know relatively little about how people who experience blackouts (hereafter, *blackout sufferers*) respond to their memory loss (White, Signer, Kraus, & Swartzwelder, 2004). In this paper we ask how—and how accurately—people reconstruct what they did during their blackouts.

## *Reconstruction strategies*

Research on source monitoring can guide our thinking about how people reconstruct and validate past experiences. The Source Monitoring Framework (*SMF*; Johnson, Hashtroudi, & Lindsay, 1993) outlines several 'internal' cues that help us to distinguish between experiences that we truly remember, and experiences that we only dreamed or imagined. For example, genuine memories tend to contain more sensory and contextual details than do imagined experiences (Johnson, Foley, Suengas, & Raye, 1988), and so we are more likely to judge mental content to be a genuine memory if it has these memory-like characteristics. What happens, though, if during reconstruction a person has few if any candidate memories to assess, as in the case of blackouts? One particular model derived from SMF research argues that people engage in a series of reasoned decisions to judge whether a suggested experience occurred (Mazzoni & Kirsch, 2002). When the suggested experience cannot be recalled, the person must first assess whether they should expect to recall it, if it *had* occurred. If so, then the suggestion can be

rejected. But if the person believes they might not recall an experience even if it had occurred, then she will next attempt to verify the experience by accumulating information to determine the likelihood that it did occur. This likelihood is compared against an implicit criterion; the suggestion is only accepted if the apparent likelihood exceeds that criterion.

Like Mazzoni and Kirsch's (2002) model, the SMF holds that people are often motivated to engage in effortful, systematic verification strategies to reconstruct the past. However, in contrast to heuristic strategies based on evaluating memory characteristics, these effortful strategies have received relatively little attention in the source monitoring literature. As an exception, there is a small body of research focusing on how people verify whether their memories are veridical (Ross, 1997). Wade and Garry (2005), for instance, asked people how they would determine whether particular childhood experiences really occurred if somebody cast their memories into doubt. Their study illustrated that people frequently consult external sources of information to this end: they ask other people or, sometimes, search for physical evidence such as photographs or written documents. In a similar vein, when Mazzoni, Scoboria, and Harvey (2010) asked subjects why they no longer believed in specific childhood events, the most common reason was that the subjects had received disconfirming evidence from another person such as a parent.

So why study the reconstruction of alcohol blackouts? One reason is that whereas researchers such as Wade and Garry (2005) have looked at strategies for verifying memories, no study has examined the strategies people use to determine what they did when they have *no* memory for a period of time (although we can learn from clinical cases; see Bryant, 1996; Harvey & Bryant,

2001). Theoretical accounts such as that of Mazzoni and Kirsch (2002) imply that searching for external evidence is less likely to happen when people can accept or reject a suggestion on the basis of having a specific memory. Therefore, studying amnesia could augment our understanding of the effortful side of source monitoring. Because blackouts are common experiences (White et al., 2002), they afford the opportunity to study these amnesia reconstruction processes on a large scale without relying on observations from individual clinical cases.

*Accuracy of reconstructions*

One aim of the present study was to gauge the likelihood that blackout reconstructions will be prone to distortion. When people are exposed to incorrect information about their experiences, they can develop false beliefs and even false memories (Garry & Wade, 2005; Loftus, 2005; Nash, Wade, & Brewer, 2009). Moreover, these beliefs and memories can have behavioral consequences (Bernstein & Loftus, 2009; Kassin & Kiechel, 1996; Wade, Green, & Nash, 2010). In the case of blackouts, such errors could have an enormous impact, not least because during blackouts people engage in (and expect to engage in) risky behaviors such as drug use, fighting, and sexual intercourse (White et al., 2004).

Observations from survey studies investigating students' drinking experiences suggest that the accuracy of reconstructions may indeed be a concern. White et al. (2004), for instance, surveyed undergraduates who had experienced blackouts, and found that almost all (94%) had on at least one occasion been told what happened by a friend. Furthermore, in 83% of these cases the informant friend had also been intoxicated during the events they described. Given alcohol's capacity to impair memory (e.g., Milani & Curran,

2000; Yuille & Tollestrup, 1990), White et al.'s findings raise doubts over the accuracy of blackout reconstructions, as do those of Giles (1999), who found that drinkers in groups often embellish and fabricate their reconstructions.

Based on the diverse research we have discussed, we were interested here in assessing [1] the strategies people use to reconstruct alcohol-induced blackouts; [2] whether blackout sufferers might be exposed to incorrect information as a result of trying to reconstruct their experiences; and [3] whether such information ever results in false beliefs or memories. To this end, we surveyed college students about their experiences of—and beliefs about—reconstructing blackouts.

## Method

### *Subjects*

Two hundred and eighty students (78.2% female; *M*= 22.2 years, *SD*= 5.10, Range= 18-47) voluntarily completed an Internet survey investigating students' experiences of the effects of alcohol on memory. Subjects were invited to participate regardless of whether they drink alcohol.

### *Materials and Procedure*

Before completing the survey, subjects provided demographic information (gender; age) and details about their usual drinking habits (whether they drink alcohol; how many units of alcohol they drink in the average week[1]).

[1] One unit was defined as roughly equivalent to: half a pint of regular-strength beer or cider; 1 small glass of wine; 1 pub measure of spirit; or half a 400ml bottle of 'alcopop'.

*Section 1*

The first section of the survey assessed subjects' evaluations of different strategies for reconstructing blackouts. We told subjects to imagine they went to a party and drank a lot of alcohol, but the next morning they remembered nothing that happened after arriving. We then asked subjects how motivated they would be to find out what happened at the party (1= Not at all motivated; 5= Extremely motivated), and how motivated they would be to use each of eight strategies (listed in Figure 1) to this end. These eight strategies were adapted from Wade and Garry (2005), who classified subjects' freely-reported strategy suggestions into five categories. Finally in this section, our subjects rated how reliable they thought each strategy would be for obtaining accurate information (1= Not at all reliable; 5= Extremely reliable).

*Section 2*

The second section asked subjects about their experience of helping others to reconstruct blackouts. We asked whether any of the following statements were true of at least one such occasion: [1] "some of the details may have been unintentionally inaccurate"; [2] "I made up some of the details"; [3] "I gave the other person an entirely made-up account of what they did." Where applicable, subjects were asked to describe what they had told the blackout sufferer, and the reasons for their possible inaccuracies.

*Section 3*

Section 3 asked about subjects' experiences of reconstructing their own blackouts. Subjects first reported whether they had ever experienced a partial or total blackout, defined as follows:

> Sometimes people forget certain periods of time from after the onset of the blackout, but remember other periods without needing to find evidence or be reminded. We refer to these experiences as PARTIAL blackouts. Sometimes people remember nothing at all from the onset of the blackout until much later or, more usually, when they awake the following day. We refer to these experiences as TOTAL blackouts.

Subjects chose from four options: [1] I have experienced a total blackout (This option also applied to respondents who had experienced both total *and* partial blackouts); [2] I have experienced a partial blackout, but I have never had a total blackout; [3] Neither, or [4] Not sure. Subjects who selected 'Total' or 'Partial' were asked to select which if any external source-types (intoxicated people; non-intoxicated people; photos/videos; other physical evidence) they had relied on to reconstruct *real* blackouts. Finally, they were asked whether they had ever learnt that they did something during a blackout, only to later discover it never really happened. Subjects who responded 'yes' reported whether they had *believed* the false event occurred (1= Not at all; 5= I was convinced that it happened), and seemed to *remember* it happening (1= Not at all; 5= I had what seemed to be a clear and detailed memory).

## Results

### *How common are alcohol-induced memory blackouts?*

Before addressing our research questions, we established the incidence of blackout experiences in our sample. Eighty-five percent of subjects were self-reported drinkers, of whom 61.2% reported having experienced a total (24.5%) or partial (but not total; 36.7%) blackout. Male drinkers were more

likely than female drinkers to have experienced a blackout [75.4% vs. 56.7%, $\chi^2(1, N= 237)= 6.42$, $p= .01$, $\phi= .17$]. Unsurprisingly, drinkers with experience of total blackouts reported the heaviest alcohol consumption ($M= 11.86$ units/week), compared to drinkers with experience of partial blackouts only ($M= 7.34$), and drinkers with no experience of blackouts or who were unsure ($M= 3.82$), $H(2, N= 237)= 34.60$, $p < .001$.

Together, these results replicate those of previous studies by showing that forgetting intoxicated experiences is common among student drinkers, especially the heaviest drinkers. The alcohol-induced blackout is therefore an excellent vehicle for studying autobiographical reconstruction processes. Given this evidence of memories lost, we were next interested in how people seek to 'fill in' their memory blanks.

*Strategies for reconstructing blackouts*

Recall that we asked how motivated subjects would be to find out what they did during a hypothetical blackout. Overall, subjects said they would be highly motivated ($M= 4.40$, $SD= 0.80$): the modal response, representing 52% of the sample, was 5 ('extremely motivated'). Just one subject—a non-drinker—claimed they would be 'not at all motivated' to reconstruct a blackout.

The darker bars in Figure 1 display subjects' motivation to use the reconstruction strategies we asked about. In the context of our hypothetical party example, subjects said they would be most motivated to ask a friend who had been at the party but had not been intoxicated. They were also inclined to try to remember by thinking hard, and to look for photographic or video evidence. Subjects were rather less motivated to ask party guests who

were not their friends (hereafter, *non-friends*), or to try to recall more by returning to the party location.

Next, we examined the degree to which subjects judged each strategy as reliable. The lighter bars in Figure 1 display these data. As well as being the strategy that subjects were most motivated to use, asking a friend who had not been intoxicated was also deemed the most reliable strategy. Looking for photographic, video or physical evidence, or asking non-friends who had not been intoxicated, were also judged as reliable strategies. The remaining four strategies were judged as unreliable (i.e., $M < 3$); two of these strategies involved intoxicated 'witnesses,' and interestingly, subjects believed that trying to remember by thinking hard might also be unreliable.

[FIGURE 1 ABOUT HERE]

There were several differences between the ratings of drinkers who had experienced blackouts and those who had not. Specifically, blackout sufferers were relatively more motivated to rely on friends who had been intoxicated [$M = 3.57$ vs. 3.12, $t(235) = 3.05$, $p < .01$, $d = 0.40$]; whereas drinkers with no experience of blackouts were more motivated to return to the party's location [$M = 1.59$ vs. 2.09, $t(164.10) = 3.51$, $p < .01$, $d = 0.48$] or to rely on non-friends who had not been intoxicated [$M = 2.08$ vs. 2.55, $t(235) = 3.19$, $p < .01$, $d = 0.43$]. Blackout sufferers perceived asking non-friends who had been intoxicated as more reliable than did drinkers with no experience of blackouts ($M = 2.09$ vs. 1.71, $t(222.88) = 3.17$, $p < .01$, $d = 0.41$. The same was true of intoxicated friends, although this difference was not statistically significant after a Bonferroni correction [$M = 2.68$ vs. 2.40, $t(235) = 2.30$, $p = .02$, $d = 0.30$].

Our data thus far tell us about subjects' beliefs regarding blackout reconstruction strategies. But which strategies had subjects actually used?

When blackout sufferers ($n$= 148) reported the external sources they had consulted to reconstruct real blackouts, we observed that consulting intoxicated people was somewhat more common (77.0%) than was consulting non-intoxicated people (69.6%; $z$= 1.45, $p$= .15). Interestingly, 43.9% said that on at least one occasion they had seen a photograph or video-recording of what happened, and 20.9% had found other physical evidence. These retrospective reports broadly mapped onto subjects' prospective reports: blackout subjects who had relied on intoxicated people in the past were also more motivated to rely on intoxicated friends ($p$< .001) and non-friends ($p$= .03) in the future, compared to those who had never relied on such sources. People who had relied on photo/video evidence ($p$< .001), and other physical evidence ($p$= .02) were also more motivated to rely on those sources in future.

*Accuracy of reconstructing blackouts*

We next explored the accuracy of blackout reconstruction strategies. To assess potential inaccuracies, subjects were asked about their experience of finding inaccuracies in their blackout reconstructions, and of being an 'informant' for other drinkers.

*Contamination of own reconstructions*

We asked the 148 blackout subjects whether they had ever been told—or otherwise found out—that they did something during a blackout, only to later discover that what they supposedly did never really happened. Twenty-five (16.9%) subjects responded 'yes.' Seventeen of these students specifically reported that the source of this incorrect information was a friend. When we asked what caused the information to be incorrect, the most frequent reason was that the source had been intoxicated. Indeed, one striking finding was that blackout subjects who had relied on intoxicated people for information in

the past—compared to those who had not—were [1] more likely to report having been exposed to misinformation, $\chi^2(1, N= 148)= 3.81$, $p= .05$, $\phi= .16$; and yet [2] *more* confident in the reliability of intoxicated friends and non-friends (both *p*s < .01). In other words, these subjects had more faith in intoxicated sources even though they were more likely to have been misled by such people.

When asked how they discovered that the event did not happen, subjects' most frequent response was that other people who were present—particularly people who were sober—had informed them. In some cases, the inaccurate source remembered what 'really' happened, or admitted to lying. Interestingly, experiences of being exposed to misinformation seemed to influence people's strategy preferences for reconstructing future blackouts. As compared to the remaining 123 blackout subjects, the 25 subjects who knew they had been exposed to misinformation reported being more motivated to look for photographs or videos [$M= 4.36$ vs. $M= 3.67$, $t(48.52)= 3.55$, $p< .01$, $d= 0.67$] and other physical evidence [$M= 4.00$ vs. $M= 3.32$, $t(146)= 2.77$, $p< .01$, $d= 0.63$].[2]

Whilst reconstructing blackouts, then, students are sometimes exposed to incorrect information about what occurred. The 25 subjects who reported having been exposed to misinformation rated their belief in and memory of the fabricated event(s). Seventeen subjects (11.5% of blackout sufferers) reported having been confident that a false event had occurred, assigning a belief rating above 3. Moreover, 5 subjects (3.4%) reported having experienced memories of a false event, assigning a memory rating above 3. Because we

[2] Note that subjects gave their 'motivation' ratings *before* being asked about their experiences of exposure to false information.

only assessed circumstances in which people had come to realise that the information they acquired was incorrect, these data likely underestimate how often blackout sufferers are exposed to incorrect information, and how often reconstructions promote false beliefs or memories. To gain an additional estimate of how often blackout sufferers receive false information, we examined people's experiences of verifying others' blackouts.

*Contamination of others' reconstructions*

The majority of our 280 subjects (70.4%) said they had been consulted for information to help someone reconstruct a blackout. Even after removing non-drinkers from analyses, these informants tended to drink more ($M$= 8.02 units/week) than did non-informants ($M$= 4.25), $t(180.54)= 3.82$, $p< .001$, $d= 0.49$, and were more likely to have experienced a blackout themselves, $\chi^2(1, N= 237)= 18.88$, $p< .001$, $\phi= .28$. This finding fits with the notion that heavy drinkers tend to associate with other heavy drinkers, and reconstruct each other's blackouts as a social activity (Giles, 1999).

The majority of informants (75.6%) admitted that they might have unintentionally provided inaccurate details about somebody else's blackout. Unfortunately, we did not assess how often these admittances were based on knowledge that errors were made, rather than acknowledgements of the fallibility of memory. However, many informants reported specific information they had told another person, which they suspected or knew to be incorrect. Examples included claiming that the person had kissed someone undesirable, vomited on another person, or exposed themselves.

Some informants admitted that they had deliberately made up details (13.7%) or even made up an entire event (7.1%). Again, many of these made-up incidents involved romantic or sexual encounters with undesirable others.

Subjects provided several reasons why they had or might have provided inaccurate information, such as straight-out lying ("I was lying"); second-hand information ("only heard it from someone else"); taking advantage of the situation ("I just wanted to scare her"); or simply getting the details wrong ("I couldn't see them very well, they could have just been hugging").

Given the high rate of informants either knowing or suspecting that they provided false information about someone else's blackout, these results point to a possible "dark figure" of errors. Moreover, even the data from informants may underestimate how often false information is provided, not least because informants are frequently intoxicated during the events they are later asked about.

## Discussion

People often feel embarrassed or scared when they learn how they behaved during an alcohol-induced blackout (White et al., 2004). Nonetheless, it is clear that blackout sufferers are still highly motivated to reconstruct their amnesic episodes. Our findings add to the small research literature on memory validation (e.g., Mazzoni et al., 2010; Ross, 1997; Wade & Garry, 2005) by providing insights into how people reconstruct autobiographical narratives when they have no memories to evaluate. As such, these data extend our knowledge of the effortful aspects of source monitoring that have received scant attention from researchers. Although our retrospective data rely on self-reports, and so are vulnerable to recollection biases and errors, they suggest that when people reconstruct forgotten recent episodes—just like when verifying childhood memories—they tend to rely on rather unreliable information sources.

### *Reconstruction strategies*

As in previous studies, our subjects reported a heavy reliance on other people, particularly friends, as a source of information (Wade & Garry, 2005; White et al., 2004). Although our subjects believed that witnesses would be more reliable sources if they had been sober at the time of the blackout, intoxicated sources were in fact more regularly relied upon than were sober sources, perhaps because obtaining reliable information can involve greater effort.

Nevertheless, people do not rely solely on others when they have no memory: Our subjects reported being motivated to search for photographic or other physical evidence of what happened, and over half reported that such evidence had helped them to reconstruct real blackouts in the past. Interestingly, the subjects who reported the greatest motivation to look for physical evidence were those who knew they had received misinformation about their blackouts in the past. Nearly one in five of our blackout sufferer subjects were aware that they had been misled during past reconstructions and, correspondingly, a substantial proportion of 'informants' knew or suspected that they had provided false information. These findings lead us to expect that blackout sufferers' reconstructions are frequently erroneous.

One interesting finding was that blackout sufferers—as compared to drinkers who had never experienced a blackout—placed significantly more confidence in the reliability of intoxicated people, and said they would be more motivated to obtain information from them. One interpretation of this finding is that the blackout subjects had often relied on intoxicated sources in the past, and contrary to expectation had found them to be helpful and reliable. This interpretation, though, is inconsistent with our finding that those subjects who *had* relied on intoxicated sources were actually more likely

to have been exposed to misinformation. An alternative explanation, then, is that in the course of reconstructing blackouts, these previously-intoxicated people might often be the only source of evidence available. Because people are highly motivated to reconstruct forgotten experiences, it is possible that such circumstances might encourage individuals to believe that the available sources of evidence are more reliable. This interpretation is consistent with Mazzoni and Kirsch's (2002) model. Recall that the model assumes that people will believe in non-remembered events if the events seem likely enough to have happened. Importantly, though, the model also holds that this "likely enough" criterion is raised or lowered to suit the circumstances. People might well lower their belief criterion when they are highly motivated to reconstruct events but the only available evidence is unreliable. Future research should test this hypothesis, which is also consistent with the SMF tenet that criterion-setting is influenced by one's goals and motivations (Johnson et al., 1993).

*Believing and remembering*

Our results add to existing research showing how beliefs and memories can be constructed using external information. Being exposed to *inaccurate* external evidence, though, can lead people to believe in and remember experiences that never occurred (Bernstein & Loftus, 2009; Loftus, 2005; Nash et al., 2009), and Mazzoni and Kirsch's (2002) model leads us to expect that blackout sufferers would be especially susceptible to such effects. As we have outlined, the model posits that people can often reject suggestions about their experiences by reasoning "I'd remember that, if it happened". Unlike people with intact memory though, blackout sufferers have no such way of assessing how 'diagnostic' their lack of a specific memory is. Thus, at this stage in the

reasoning process the blackout sufferer cannot rule out suggestions—even those about experiences that should be highly memorable—and must therefore collect and rely on external information. According to the Mazzoni and Kirsch model, if the information gathered is false, then the only remaining way to avoid a false belief is to set a high belief criterion. Yet, as we have speculated, our data seem instead to suggest that blackout sufferers might be inclined to adopt low criteria. In sum, then, it seems that the nature of blackouts can preclude sufferers from using most of the metacognitive toolkit that typically enables us to resist false beliefs and memories. With people's proclivity to rely on unreliable evidence sources, reconstructing blackouts might often cultivate errors.

Indeed, a small proportion of our subjects said that they had believed some false information they learned while reconstructing a blackout. A smaller proportion said they had experienced this belief as a memory. The occurrence of these false beliefs and memories is important because autobiography has self-fulfilling effects on attitudes and behavior: people infer how they will behave in the future by considering how they behaved in the past (Ross & Buehler, 2004; Wilson & Ross, 2003). We can only speculate about the consequences that blackout sufferers' false beliefs and memories could in some cases have. For instance, archival studies suggest that numerous innocent people have confessed to crimes after being led to believe they committed the acts whilst drunk (Gudjonsson, 2003; Leo, 2008), and flawed reconstructions might also lead blackout sufferers to make false accusations against others (Davis & Loftus, 2004). The misinformation our subjects were aware of receiving—and that informants were aware of providing—rarely concerned criminal acts, but it did frequently concern

unwanted and embarrassing acts such as having sexual encounters with strangers. In the least, we can say that learning (correctly or incorrectly) that one engaged in these types of behavior during a forgotten time-period could plausibly have emotional, psychological, and social repercussions.

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Author note

Address correspondence to Robert Nash, Department of Psychology, University of Surrey, Guildford, Surrey, GU2 7XH, England; Email: R.Nash@surrey.ac.uk.

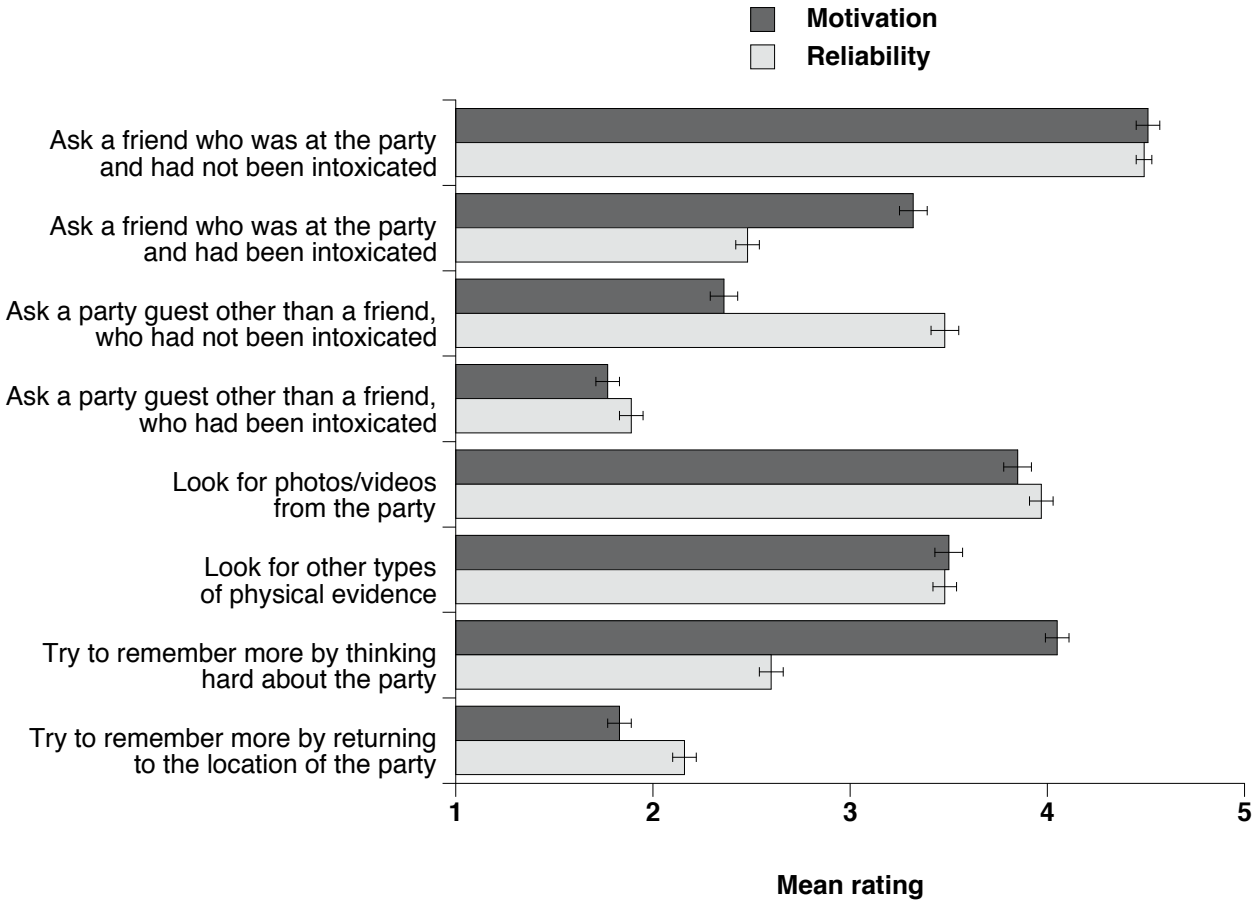


*Figure 1*. Mean motivation and reliability ratings assigned to specific blackout reconstruction strategies, ±1*SE*.