Alcohol and Reduction in Gambling Behavior –

Does Alcohol-Induced Myopia Help?

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Abstract

Prolonged and risky gambling can have negative consequences financially (e.g., loss of high amounts of money) and in health (e.g., development of an addiction). Following alcohol myopia theory (Steele & Josephs, 1990), stating that intoxicated people's behavior is disproportionally guided by salient cues, we investigated whether making low chances of winning salient in a gambling situation can reduce persistent and risky gambling. In two laboratory studies participants either consumed alcohol or a placebo and then took part in a game of chance. In Study 1, we made low chances of winning salient by highlighting the slogan "Chance of winning: 1/1000" on a computerized slot machine. In Study 2, we made low chances of winning salient by highlighting the chances of winning on lottery tickets. Making low chances salient led intoxicated participants to gamble less persistently (Study 1) and with less risk (Study 2) compared to sober participants and compared to participants in a no-salience-control-condition (i.e., low chances not salient). Using an eye-tracker in Study 2, we observed that intoxicated (vs. sober) participants in the low-chances-salient-condition paid more attention to the salient low chances and less attention to the non-salient gains, which accounted for the effect of alcohol on reduced risk-taking. In Study 3, we replicated the findings of our first two laboratory studies in the field: When low chances were made salient by highlighting the slogan "Chance of winning 1/5000" on our computerized slot machine, the more alcohol bar patrons of a local bar had consumed, the fewer trials they played. Findings provide support for the attentional processes proposed by alcohol myopia theory; they suggest that making low chances of winning salient could be an effective intervention for reducing persistent and risky gambling under the influence of alcohol.

Keywords: alcohol myopia theory, slot machine gambling, risk-taking, eye-tracking, field experiment

Alcohol and Reduction in Gambling Behavior – Does Alcohol-Induced Myopia Help?

In Las Vegas, many casinos provide gamblers with free drinks to encourage gambling. Similarly, in Germany, casinos use alcoholic beverages for advertising their venues. That this strategy is successful shows a survey on alcohol use and gambling that finds that 70% of the participants indicated that they had consumed alcohol on their recent visit to a gambling venue (Markham, Young, & Doran, 2012). The idea behind offering free alcoholic beverages in casinos might be the common assumption that alcohol intoxication promotes risky behavior such as prolonged and risky gambling.

However, empirical findings on the effect of alcohol intoxication on gambling behavior are mixed: On the one hand, some studies found that alcohol intoxication led to larger bets in a simulated slot machine (Cronce & Corbin, 2010), to higher gambling persistence (Kyngdon & Dickerson, 1999), to more risk-taking in a simulated card game (Phillips & Ogeil, 2007), and to more risky gambling choices in a decision task (Lane, Cherek, Pietras, & Tcheremissine, 2004). On the other hand, several other studies found no effect of alcohol on gambling behavior, for example in a card game (Balodis, MacDonald, & Olmstead, 2006), in betting (Breslin, Sobell, Cappell, Vakili, & Poulos, 1999), and in a decision task (Corazzini, Filippin, & Vanin, 2015; Meier, Brigham, Ward, Myers, & Warren, 1996). Finally, further studies show that alcohol can even decrease the willingness to gamble (Sjöberg, 1969) and alcohol consumption was found to be associated with lower levels of risk-taking in a lottery game (Cortes Aguilar et al., 2013).

Given these mixed results, the precise effect of alcohol on gambling behavior remains unclear and not well understood. Since gambling frequently occurs in conjunction with alcohol intake (Markham et al., 2012) and since prolonged and risky gambling can have negative consequences financially (e.g., loss of high amounts of money) and in health (e.g., development of an addiction), it would be crucial to gain more knowledge about the precise

mechanisms, when and why alcohol intake increases or decreases gambling behavior to develop pre- and interventions to reduce gambling behavior under the influence of alcohol.

Therefore, as a first goal of the present project, we employed alcohol myopia theory (Steele & Josephs, 1990) to investigate the mechanism by which alcohol interacts with situational variables to affect gambling behavior and whether this myopic effect of alcohol can be used to reduce prolonged and risky gambling.

Alcohol Myopia Theory

According to alcohol myopia theory (Steele & Josephs, 1990), acute alcohol intake limits cognitive processes and leads people to perceive and process only a limited amount of information. Alcohol, therefore, creates selective attention and as a result, intoxicated individuals are more likely to focus on the most salient aspects of a given situation while excluding more distal aspects. Consequently, people's behavior is most strongly guided by salient cues and their social behavior (e.g., aggression, anxiety, drinking and driving, risky sexual behavior) becomes more extreme or excessive. This process of restricted attention is named cognitive shortsightedness (i.e., myopia) to which the term of the theory refers.

Alcohol myopia theory states that people under the influence of alcohol *increase* or *decrease* a certain social behavior depending on what the most salient cues imply. When *impelling* cues are salient, people under the influence of alcohol are *more* likely to behave in an extreme manner (increase in the respective social behavior), whereas when *inhibiting* cues are salient, people under the influence of alcohol are *less* likely to engage in this type of social behavior (decrease in the respective social behavior). When no cues are salient in a situation, people under the influence of alcohol behave no differently than sober people.

Testing the theoretical assumptions proposed by alcohol myopia theory, MacDonald, Zanna, and Fong (1995) showed that the intention to drink and drive only differed between intoxicated and sober participants when impelling cues were made salient in a questionnaire

by emphasizing the positive factors of drinking and driving (e.g., arriving home quickly). Without making this positive aspect salient, the intention to drink and drive did not differ between intoxicated and sober participants. Similarly, regarding the intention to risky sexual behavior, intoxicated (vs. sober) participants were more willing to engage in unprotected sexual intercourse when it was written in a vignette that the female counterpart was on the pill and additionally emphasized that a pregnancy would be unlikely (impelling cue condition). They were, however, less willing to engage in unprotected sexual intercourse when it was questioned whether the male could trust the female's statement of being on the pill (inhibiting cue condition; MacDonald, Fong, Zanna, & Martineau, 2000, Study 4). Furthermore, intoxicated (vs. sober) participants expressed higher levels of anxiety when a stress-evoking cue (i.e., giving a speech) was made salient; however, intoxicated (vs. sober) participants expressed lower levels of anxiety when their attention was distracted from the stress-evoking cue by performing another task (Josephs & Steele, 1990). In the same vein, intoxicated (vs. sober) participants expressed higher levels of aggression when provocative cues (electric shocks from a fictitious opponent) were made salient; however, intoxicated (vs. sober) participants expressed lower levels of aggression when they were distracted from the provocative cues (Giancola & Corman, 2007).

The effect claimed by alcohol myopia theory has been tested in several domains of social behavior, for example in the domain of attribution of social inferences: intoxicated (vs. sober) participants exaggerated the importance of either dispositional or situational influence of behavior depending on which aspect was made salient (Herzog, 1999), in the temporal domain of attention: intoxicated participants were more influenced by information recently encountered and less influenced by distal information, whereas sober participants were more influenced by distal information and less influenced by information recently encountered

(Fleming et al., 2013), and memory: intoxicated (vs. sober) participants recalled less peripheral information of a social interaction (Compo et al., 2011).

Recent research has shown that the myopic effect is not only caused by alcohol – the effect can also emerge through high cognitive load which has been named attentional myopia (e.g., Mann & Ward, 2004; Ward & Mann, 2000; Westling, Mann, & Ward, 2006). Several studies found that restricted attentional resources led either to a loss of control (less self-control) – the undesired behavior (e.g., eating high-calorie food while dieting) increased when impelling behavioral cues were salient – *or* to more control over the undesired behavior (enhanced self-control) – the undesired behavior decreased when inhibiting cues were salient. For example, when dieters under high (vs. low) cognitive load were exposed to cues which encouraged eating (laboratory contained salient food items), they tended to consume more of a high-fat milkshake. However, when dieters under high (vs. low) cognitive load were exposed to cues which discouraged eating (e.g., laboratory contained diet-related cues), they consumed less of a high-fat milkshake (Ward & Mann, 2000). Similarly, when smokers under high (vs. low) cognitive load were exposed to cues which encouraged smoking (e.g., advertisement for cigarettes, flyer for a study "benefits of smoking on cognition"), they tended to take more puffs of a cigarette. However, when smokers under high (vs. low) cognitive load were exposed to cues which discouraged smoking, (e.g., advertisement for nicotine gum, flyer for a study "benefits of quitting smoking"), they took fewer puffs of a cigarette (Westling et al., 2006, Study 2).

Alcohol Myopia Theory and Attentional Processes

Although alcohol myopia theory makes assumptions about attentional processes by stating that alcohol narrows attention, which then restricts the attentional focus to the most salient cues, the precise mechanism of how alcohol-induced myopia affects attentional processes has not been studied in greater detail. To our knowledge, only two studies exist

which investigated whether the alcohol-induced attentional processes proposed by alcohol myopia theory account (i.e., mediate) for the effect of alcohol on the respective social behavior. In one study, the authors replicated the findings of Giancola and Corman (2007) that intoxicated participants who were provoked showed less aggression when they were distracted from the provocative cue compared to intoxicated participants who were not distracted (Gallagher & Parrott, 2011). Beyond the data replication, they found that distracted, intoxicated participants also displayed less attention allocation to aggressive stimuli (i.e., slower responses to aggression-related words relative to neutral words) compared to the intoxicated, non-distracted participants. However, the mediation analysis failed to reach statistical significance, which tested whether the lower attentional bias to aggression-related words accounted for the association between alcohol and lower levels of aggression in intoxicated, distracted men. In a second study, Sher, Bartholow, Peuser, Erickson, and Wood (2007) replicated the findings of Josephs and Steele (1990) that intoxicated (vs. sober) participants expressed lower levels of anxiety, measured by self-reported anxiety and physiological measures (i.e., heart rate and skin conductance level), when their attention was distracted from a stress-evoking cue (i.e., giving a speech). In addition, they observed that impaired sustained attention (i.e., maintaining attention over a longer period of time) accounted for the effect of alcohol on skin conductance – however, no effect of alcohol on anxiety mediated by attention was found for the other two dependent variables (heart rate and self-reported anxiety).

Given the inconsistent findings of the previous studies on the effect of alcohol myopia on attentional processes, as a second goal of the present project, we aimed to investigate whether the attentional focus to the most salient cues proposed by alcohol myopia theory can be measured by increased visual attention on the salient cues and whether this effect of

alcohol-induced myopia on visual attention accounts for the effect of alcohol on gambling behavior.

In summary, alcohol causes restricted and selective attention which can either increase *or* decrease a certain behavior depending on which cues are salient in a given situation. One domain in which extreme and excessive behavior is detrimental depicts gambling as prolonged and risky gambling can have negative consequences financially (e.g., loss of high amounts of money) and in health (e.g., development of an addiction). In addition, maladaptive behavior within even a single gambling session can set the stage for the development of problematic or pathological gambling (i.e., "chasing" for a certain amount of money lost earlier by continuing gambling; Cronce & Corbin, 2010). Therefore, the development of an approach to intervene at an early stage would be crucial for preventing excessive gambling.

Gambling Behavior

Gambling is defined as "the wager of any type of item or possession of value upon a game or event of uncertain outcome in which chance, of variable degree, determines such outcome" (Bolen & Boyd, 1968, p. 619). Between 70 and 90% of adults in western societies indicate that they have gambled at some time in their lives (Bundeszentrale für gesundheitliche Aufklärung, 2014; Eisen et al., 1998; Kessler et al., 2008; Ladouceur, 1991; Productivity Commission, 1999). However, only a minority develop an addiction to gambling. Lifetime prevalence rates of pathological gambling are around 0.4 to 1.6% in a range of countries (e.g., Cunningham-Williams, Cottler, Compton, & Spitznagel, 1998; Ladouceur, 1996; Petry, Stinson, & Grant, 2005; Shaffer, Vander Bilt, & Hall, 1999). In Germany, the lifetime prevalence rate is around 1.4% for problem gambling and around 1.0% for pathological gambling (C. Meyer et al., 2011).

Legislation on gambling differs from country to country (for an overview, see Nikkinen, 2014). For example, Finland, Germany, the Netherlands, Poland, Portugal, Romania, and Sweden are countries with a public monopoly. Meaning casinos or other similar venues can be state-run or are controlled by the state. One disadvantage of this model constitutes the bilateral role of the state: On the one side, the state is interested in the profits made from gambling and on the other side, the state has to prevent the development of addiction through its policies. Another model depicts license-based systems where foreign operators apply for licenses to provide gambling, and these operators are not necessarily state-owned. Countries in which this system is implemented are, for example, Slovakia, Spain, France, Denmark, and Austria. In some countries, each province or state, respectively, has its own gambling regulations, for example, Canada and the United States. In most Asian countries gambling policies are very restrictive, and gambling is completely prohibited or only state lotteries (Thailand, China) are allowed. Despite gambling regulations, gambling has become more accessible and widespread particularly through internet gambling. As a consequence, not only the profit made from gambling but also the lifetime prevalence of pathological gambling has increased in the last few years (e.g., Bundeszentrale für gesundheitliche Aufklärung, 2010; Petry & Armentano, 1999).

According to the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; American Psychiatric Association, 1994) and the *International Statistical Classification of Diseases and Related Health Problems* (*ICD-10*; World Health Organization, 1999), pathological gambling is categorized as an impulse control disorder. It depicts repeated episodes of gambling and the intensive, uncontrollable urge to gamble. These episodes are continued despite negative consequences such as personal distress, financial hardship, and interpersonal problems. With the release of the new *DSM-V* (American Psychiatric Association, 2013) pathological gambling, which has been renamed as gambling disorder, is

now classified in the category substance-related and addictive disorders. This change is due to the findings of recent research regarding the neurological processes of problem gambling. It was shown that problematic and pathological gambling has similarities to other forms of addictive disorders, for example, the same activation of the reward center through drug-related cues (i.e., gains; Balodis et al., 2012) and the development of a tolerance to the drug (i.e., need to gamble with higher stakes to experience the desired feeling; Shaffer & Kidman, 2003). Pathological gamblers also report a craving regarding gambling cues (Potenza et al., 2003) and might even suffer from withdrawal symptoms (Wray & Dickerson, 1981) – a further parallel to other forms of addiction (for an overview, see Reilly & Smith, 2013). Negative consequences of pathological gambling do not only affect the physical and mental health of the addict but also society through crimes committed by gamblers and the costs of treatment (Productivity Commission, 1999). In addition, domestic violence or neglect of family can be a consequence of interpersonal problems between the gambler and his or her social network (Lorenz & Yaffee, 1986, 1988, 1989).

Especially when gambling and drinking occurs in conjunction, problematic (i.e., addictive) behavior seems to arise: Simultaneous drinking and gambling (Welte, Barnes, Wieczorek, & Tidwell, 2004) and heavy drinking (Smart & Ferris, 1996) were found to be strong predictors for whether a person suffered from pathological gambling (or not). Similarly, pathological gambling often occurs with an addiction to alcohol: Among pathological gamblers almost three-quarters (73.2%) had an alcohol use disorder, of these three-quarters, about half (47.8%) suffered from alcohol abuse, and one-quarter (25.4%) suffered from alcohol dependence (Kessler et al., 2008; Petry et al., 2005).

Alcohol Myopia and Gambling

In gambling people bet or wager money to win a prize or jackpot, and this prize is determined by a certain probability of winning. In most gambling situations (e.g., the lottery,

slot machines) the potential jackpot in the game is rather high, whereas the probability of actually winning the jackpot is rather low. At the same time, people's expected chances of successfully attaining a desired outcome (e.g., chances of winning) strongly influence the decision to pursue that valued outcome (e.g., winning the jackpot), which is proposed by expectancy x value theories of motivation (Atkinson, 1957; Locke & Latham, 1990; McClelland, 1987; summary by Oettingen & Gollwitzer, 2001). However, if the chances of winning are rather low in gambling situations, why do people start to gamble? Several explanations are possible which support the assumption of expectancy x value theories in the domain of gambling behavior.

One possible explanation would be that the potential gain (i.e., jackpot) depicts such a strong value that the value evens up the low chances of winning regarding the proposed function of expectancy x value theories, and therefore people will continue to pursue the valued outcome by gambling.

Another possible explanation would be that the gambler overestimates the chances of winning. Indeed, illusionary cognitions related to the chances of winning (i.e., overestimation of the probabilities of winning) were found to promote the willingness to gamble (Gibson, Sanbonmatsu, & Posavac, 1997). Illusions on the chances of winning were also associated with enhanced risk-taking by betting higher amounts (Delfabbro & Winefield, 2000; Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997). In addition, according to the pathway model of problem gambling proposed by Blaszczynski and Nower (2002), illusionary probabilities of winning is one cause for uncontrolled gambling and may contribute to the development of pathological gambling. In the same vein, regular (Coulombe, Ladouceur, Desharnais, & Jobin, 1992) and pathological gamblers (Ladouceur, 2004) have been shown to express stronger illusions of the expectation of winning. In addition, the structural characteristics of certain games reinforce the illusionary cognitions by

“near-wins” or aural and visual accentuation. For example, slot machines signalize a win accompanied by striking sounds and lights in order to illustrate the win for all gamblers in the venue. As a consequence, the gambler overestimates the occurrence of a win and underestimates the occurrence of a loss (G. Meyer & Bachmann, 2011).

Moreover, casinos or other gambling venues highlight only the potential jackpot, but the low chances of actually winning the jackpot are not visibly indicated or even transparent (i.e., regarding roulette: the chances of winning are not visibly indicated but can be calculated; regarding slot machines: the chances of winning cannot be calculated and therefore are not even transparent). Therefore, in most gambling situations only the valued outcome (i.e., gain) and not the expected chances can be taken into account with regard to the decision to pursue gambling, which should enhance persistence in gambling.

In contrast, people should gamble less persistently when they are drawn to the low chances of winning. On the basis of alcohol myopia theory, stating that intoxicated people’s behavior is disproportionally guided by salient cues in a situation, especially intoxicated participants should focus on highlighted low chances and as a consequence they should gamble less persistently.

Preliminary support for this idea comes from a previous study on the effect of alcohol myopia on commitment to unattainable goals: When the low chances of attaining the desired goal were made salient through highlighting the low feasibility in a questionnaire, participants attached themselves less to the goal compared to sober participants (Sevincer & Oettingen, 2014; Sevincer, Oettingen, & Lerner, 2012). Based on these findings and following alcohol myopia theory, we propose that by making the low chances of attaining the goal (i.e., low chances of winning) salient in a gambling situation, intoxicated gamblers should focus on the low chances and this should lead them to gamble less persistently and to take less risk.

The Present Research

We aimed to investigate how acute alcohol intake influences gambling behavior. In three studies we examined whether highlighting the low chances of winning can reduce persistent and risky gambling under the influence of alcohol based on alcohol myopia theory.

In Study 1, occasional gamblers either consumed alcohol or a placebo in the laboratory. Thereafter, they participated in a computerized slot machine game. We manipulated the salience of the low chances of winning by explicitly displaying the slogan "Chance of winning: 1/1000" in large letters on the computer screen. The slogan providing the gain "Win up to 300€" was displayed in small letters below. In the no-salience-control-condition – as customary on commercial slot machines and to keep the provided features and information concerning the chances of winning and the gain constant in both conditions – the slogan concerning the gain was displayed in large letters, and the slogan of the low chances of winning was displayed in small letters below (i.e., chances of winning are not made salient). As an indicator for persistent gambling, we assessed the number of trials played and the amount of money lost. We hypothesized that through the alcohol-induced myopic effect occasional gamblers should focus on the salient low chances and should ignore the information regarding the gain. Sober occasional gamblers, however, should be able to perceive and process all given information since they are not constrained by alcohol-induced myopia. Also, occasional gamblers – either intoxicated or sober – in the two no-salience-control-conditions (alcohol-no-salience-control-condition and placebo-no-salience-control-condition) should be able to process all given information regarding the gain and the low chances of winning since no salience manipulation was applied. Thus, only the behavior of intoxicated occasional gamblers should be influenced by the highlighted inhibiting cue (i.e., low chances of winning).

Accordingly, we predicted that when the low chances of winning are salient, intoxicated occasional gamblers (alcohol-low-chances-salient-condition) should gamble less persistently compared to sober occasional gamblers (placebo-low-chances-salient-condition) and compared to occasional gamblers in each of the no-salience-control-conditions (alcohol-no-salience-control-condition, placebo-no-salience-control-condition).

In Study 2, we examined whether making the low chances of winning salient not only influences persistent gambling but also risk-taking in gambling choices. We adopted the same procedure as in Study 1. To assess risk-taking, we used a gambling paradigm from the domain of economics, namely the random lottery pair paradigm (Camerer, 1989; Harrison & Rutstrom, 2008; Hey & Orme, 1994). In this paradigm, a series of lottery pairs are presented that vary in the amount of gains and probabilities of winning. In each pair, one lottery ticket has a higher gain with a lower chance of winning; the other lottery ticket has a lower gain with a higher chance of winning. The choice of the lottery ticket with a higher gain and a lower probability of winning is considered as an indicator for risk-taking. Participants then indicated which lottery ticket they chose. We manipulated the salience of the low chances of winning on the lottery tickets as in Study 1 – in the low-chances-salient-condition, the chances of winning were highlighted, whereas in the no-salience-control-condition, the chances were indicated but not highlighted. Additionally, we examined whether participants focused their attention on cues related to the gains and the chances of winning: While participants were choosing between the two lottery tickets, we measured whether and how long they fixated the respective slogan pertaining to the gains and the chances of winning by using an eye-tracker.

We hypothesized that when the low chances of winning are salient, intoxicated participants (alcohol-low-chances-salient-condition) should choose the lottery ticket with a higher gain and a lower winning probability less often, and therefore should gamble with less

risk compared to sober participants (placebo-low-chances-salient-condition) and compared to participants in each of the no-salience-control-conditions (alcohol-no-salience-control-condition, placebo-no-salience-control-condition). Furthermore, we hypothesized that this myopic effect of alcohol on reduced risk-taking is mediated by the increased attention on the salient low chances: Alcohol should lead to more visual attention on the salient low chances and to less attention on the non-salient gains, which should, in turn, predict reduced risk-taking in the lottery game.

In Study 3, to test our hypothesis that making the low chances of winning salient leads to reduced gambling behavior not only in the controlled setting of a laboratory but also in a more naturalistic setting, we investigated the gambling behavior of bar patrons. We assessed patrons' blood alcohol level (BAC) and invited them to gamble on our manipulated slot machine from Study 1. We hypothesized that the salience manipulation (low-chances-salient-condition vs. no-salience-control-condition) should influence the relationship between alcohol and gambling behavior: When low chances of winning are salient, the higher participants' BAC, the fewer trials they should play. Furthermore, intoxicated participants in the low-chances-salient-condition should play less persistently compared to intoxicated participants in the no-salience-control-condition.

Preliminary Study: Testing the Salience Manipulation of Low Chances of Winning

We conducted a preliminary study to test our manipulation of making the low chances of winning salient on our computerized slot machine. According to Higgins (1996) "salience is something about a stimulus event (…) that draws attention selectively to a specific object of perception or thought." (p. 156). There are two dimensions through which an object can be salient: (1) through its *natural prominence* and (2) through *comparative distinctiveness*. Natural prominence refers to how noticeable the features or properties of an object are, for example a bright and moving object will draw attention. However, highlighted properties are

not individually salient, the salience of an object always depends on the comparison to other objects and their properties. This aspect is called comparative distinctiveness. An object can be distinctive because its properties differ in comparison to all other objects (e.g., a female in a male group) or because of its novelty in a given context, for example “the salience of a cow versus a couch would vary depending on its location in an apartment versus a pasture” (Higgins, 1996, p. 157). We manipulated the salience of the low chances of winning in our computerized slot machine on both aforementioned dimensions. We displayed the slogan “Chance of winning: 1/1000” in large letters on the screen of a computerized slot machine. By displaying the chances of winning in large letters, we manipulated the first factor of salience (i.e., natural prominence). Furthermore, in most gambling situations only the potential jackpot is displayed, but the low chances of actually winning the jackpot are not visibly indicated or even transparent. Displaying the low chances of winning on a slot machine should be unfamiliar and depict a “novelty” in the given gambling context. Therefore, by highlighting the chances of winning in the gambling context, we manipulated the second factor of salience (i.e., comparative distinctiveness).

We tested our salience manipulation by showing one group of participants a picture of the background of the slot machine where the low chances of winning were highlighted (low-chances-salient-condition), and another group a picture of the same slot machine where the low chances of winning were *not* made salient and instead the potential gain was clearly indicated – as customary on commercial slot machines (no-salience-control-condition). Participants were then asked to rate the different features indicated on the slot machine regarding the two dimensions of salience. Specifically, they rated how prominent and how distinctive the main slogan of the respective condition was: In the low-chances-salient-condition they rated the main slogan “Chance of winning: 1/1000” on the two dimensions of salience; in the no-salience-control-condition, the gain was indicated as the main slogan (as

customary on commercial slot machines), and participants rated the slogan: “Win up to $300” on the two dimensions of salience.

To summarize, the preliminary study aimed to explore whether we manipulated the low chances of winning on our computerized slot machine successfully on the two dimensions of salience: Since we displayed the slogan of the low chances of winning in large letters, we assumed that participants should rate the slogan as prominent and noticeable which relates to the first salience dimension prominence of the properties. In addition, since displaying the low chances of winning should be unusual in a gambling context, we assumed that participants should rate the slogan as unfamiliar and unexpected which relates to the second salience dimension comparative distinctiveness. To compare the ratings of the features of our manipulated slot machine on which the low chances were made salient with conditions in which gamblers are usually faced with (meaning slot machines on which the gains are indicated, and low chances are not made salient), participants in a no-salience-control-condition rated the features of a slot machine which resembled a commercial slot machine.

Method

Participants and Design

We recruited 121 participants (64 women, 57 men, $M_{age} = 35.70$, $SD = 10.57$, age range: 22 – 70 years) via Amazon’s Mechanical Turk (Buhrmester, Kwang, & Gosling, 2011). All participants were currently living in the United States, and 96.7% indicated English as their native language. Regarding ethnicity, 87.6% of the participants identified themselves as Caucasian, 5.8% as Asian-American, 4.9% as African-American, and 1.7% as other. Regarding experience in gambling, 94.2% indicated that they had gambled at least once in their lives. Participants were randomly assigned to either the low-chances-salient-condition or the no-salience-control-condition.

Procedure

Participants filled out an online questionnaire via Qualtrics, a website to create and provide surveys. After giving informed consent, participants were presented with a picture of a slot machine. In the low-chances-salient-condition, the slogan “Chance of winning 1/1000” was displayed in large letters on the upper part of the slot machine and the slogan providing the gain “Win up to $300” was displayed in small letters below. In the no-salience-control-condition – as customary on commercial slot machines and to keep the provided features and information concerning the chances of winning and the gain constant in both conditions – the slogan concerning the gain was displayed in large letters on the upper part of the slot machine and the slogan of the low chances was displayed in small letters below (Figure 1).

Salience ratings. To investigate whether the low chances of winning were indeed salient in the respective condition, participants in both groups were given two questions regarding the prominence of the properties of the indicated gain and the chances of winning on the slot machine. To test our assumption that explicitly displaying the low chances of winning is unusual in a gambling context, participants in both groups were given four questions regarding the comparative distinction to estimate the novelty of the indicated gain and the chances of winning on the slot machine.

To measure the prominence of the properties, we asked participants the following questions regarding the slogan of the gain and the chances of winning, respectively: “When you think about the slot machine on the first page and how it looked: How prominent did you perceive the feature of the slogan ‘Win up to $300’/ ‘Chance of winning: 1/1000’?” and “How noticeable was the feature of the slogan ‘Win up to $300’/ ‘Chance of winning: 1/1000’?”. Participants answered on a 7-point scale ranging from 1 (*Not prominent at all* and *Not noticeable at all*, respectively) to 7 (*Extremely prominent* and *Extremely noticeable*, respectively).

To measure the comparative distinctiveness, we asked participants the following questions: “How typical did you find the feature of the slogan ‘Win up to $300’/ ‘Chance of winning: 1/1000’?” and “How familiar did you find the feature of the slogan ‘Win up to $300’/ ‘Chance of winning: 1/1000’?”. Both items were answered on a 7-point scale ranging from 1 (*Not typical at all* and *Not familiar at all*, respectively) to 7 (*Extremely typical* and *Extremely familiar*, respectively). In addition, we asked participants “How surprised were you by the feature of the slogan ‘Win up to $300’/ ‘Chance of winning: 1/1000’?” and “Did you expect the feature of the slogan ‘Win up to $300’/ ‘Chance of winning: 1/1000’?”. Both items were answered on a 7-point scale ranging from 1 (*Not surprised at all* and *Totally unexpected*, respectively) to 7 (*Extremely surprised* and *Totally expected*, respectively).

The two items of the questions regarding the prominence of properties (prominent and noticeable) showed excellent internal consistency (Cronbach’s $\alpha = .90$). Therefore, we combined them into one index of the prominence of properties (scores could be achieved between 2 and 14), with higher scores on the index indicating more prominence of the properties. The four items regarding the comparative distinctiveness (typical, familiar, and expected reverse coded and surprised) also showed excellent internal consistency (Cronbach’s $\alpha = .91$). Therefore, we combined them into one index of comparative distinctiveness (scores could be achieved between 4 and 28), with higher scores on the index indicating more comparative distinction.

Confounding variables. Following the ratings of salience, participants answered the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) to assess severity of gambling. The SOGS depicts a self-report screening that assesses gambling behavior over a lifetime. It consists of 16 items. Scores can be achieved between 0 and 20, whereby a score of 3 or 4 serves to identify problematic gambling; a score of 5 or higher points to probable pathological gambling. Items were developed based on the *DSM-III* (American Psychiatric

Association, 1975) criteria for pathological gambling. The SOGS shows an excellent internal consistency (Cronbach's α = .97) and acceptable test-retest reliability of r_{tt} = .71 (Lesieur & Blume, 1987). In our sample of the preliminary study, the SOGS showed an excellent internal consistency (Cronbach's α = .91). We controlled for this possible confounding variable since we assumed that severity of gambling and therefore frequent gambling may be associated with more familiarity of gambling situations and therefore the appearance of gambling machines. However, we decided to measure severity of gambling after the salience manipulation to avoid the possible influence of the gambling questionnaire on the salience ratings (dependent variable). Meaning that this order of the questionnaires might have triggered participants to contemplate over their gambling behavior which could have influenced the ratings of the salience.

In addition, we controlled for the possible influence of gender since men gamble more frequently than women (Bundeszentrale für gesundheitliche Aufklärung, 2010) and they enjoy games of chance more than women (G. Meyer & Bachmann, 2011). We assumed that men, therefore, might display a higher preference for games of chance which might be associated with the salience ratings (dependent variable).

The questionnaire ended with demographic items assessing gender, age, employment, native language, current location, and race. After completing the questionnaire, participants were thanked for taking part, were fully debriefed, and received $0.50 as compensation for their time.

Results

Preliminary Analyses

We conducted several *t*-tests for independent samples to check for equal distribution of demographic and confounding variables across the two salience groups. Participants in the two salience conditions did not differ on the following variables: age[1], $t(118) = -0.26$,

p = .797, and severity of gambling[1] (measured by the SOGS), $t(118) = 0.21$, p = .983. Chi-square analysis revealed no significant difference in gender distribution between the two conditions, $\chi^2(1) = 0.99$, p = .319.

Descriptive Analyses

Participants' ratings of how prominent (M = 5.28, SD = 1.55) and how noticeable (M = 5.73, SD = 1.55) the slogan of the low chances of winning was, were above the midpoint of the 7-point scale (no-salience-control-condition: prominent: M = 5.31, SD = 1.69 and noticeable: M = 5.64, SD = 1.63). In addition, the rating how surprised (M = 4.63, SD = 2.01) participants were about the slogan of the low chances of winning was above the midpoint of the 7-point scale (no-salience-control-condition: M = 2.82, SD = 1.97). The ratings of how familiar (M = 3.18, SD = 1.80), how typical (M = 3.27, SD = 1.75), and whether the slogan of the low chances of winning was expected (M = 2.88, SD = 1.78) were below the midpoint of the 7-point scale (no-salience-control-condition: familiar: M = 5.00, SD = 1.92, typical: M = 5.43, SD = 1.61, and expected: M = 4.71, SD = 1.80). See Table 1 for means and standard deviations for the respective ratings for each group.

Salience Ratings

We conducted a multivariate analysis of variance (MANOVA) with the two salience conditions (low-chances-salient-condition and no-salience-control-condition) as independent variable and salience ratings regarding the main slogan (slogan which was demonstrated in large letters: in the low-chances-salient-condition: "Chance of winning: 1/1000" and in the no-salience-control-condition: "Win up to $300") as dependent variables. There was a significant difference in salience ratings based on the salience conditions[1], $F(2, 117) = 23.57$, $p < .001$, Wilk's $\Lambda = .71$, $\eta_p^2 = .29$.

Regarding the index of the prominence of properties (items prominent and noticeable), follow-up univariate analysis (ANOVA) revealed no difference between the low-

chances-salient-condition (M = 11.05, SD = 2.99) and the no-salience-control-condition (M = 10.95, SD = 3.15), $F(1, 118) = 0.03$, $p = .859$. Since both main slogans (low-chances-salient-condition: “Chance of winning: 1/1000” and no-salience-control-condition: “Win up to $300”) were displayed in large letters, this result comes as no surprise and shows that both slogans were striking regarding their properties.

Regarding the index of comparative distinctiveness (items typical, familiar, and expected reverse coded and surprised), follow-up univariate analysis (ANOVA) revealed a significant difference, $F(1, 118) = 46.23$, $p < .001$, $\eta_p^2 = .28$. Participants in the low-chances-salient-condition rated the main slogan as more distinctive (M = 19.37, SD = 6.41) in the given context compared to the participants in the no-salience-control-condition (M = 11.69, SD = 5.97). Therefore, in comparison to gambling situations in which people are usually faced with (i.e., gain indicated and low chances of winning not salient), the highlighted slogan “Chance of winning: 1/1000” in the low-chances-salient-condition showed a novelty in the context and accomplished both dimensions (prominence of properties and comparative distinction).

Confounding Variables

In a first step, before conducting the analyses controlled for the confounding variables, we investigated whether the salience manipulation had an effect on the responses of gambling behavior since we measured severity of gambling (measured by the SOGS) after the salience manipulation. In addition, we investigated whether severity of gambling was associated with the salience manipulation. Participants in the two salience conditions (low-chances-salient-condition and no-salience-control-condition) did not differ on severity of gambling[1] (measured by the SOGS), $t(118) = 0.21$, $p = .983$. Severity of gambling did neither correlate with the ratings of the slogans pertaining to the gains or chances, respectively, in general, $r_s s \leq -.08$, $p \geq .380$, nor did severity of gambling correlate with the ratings within the

low-chances-salient-condition, r_ss ≤ -.15, $p \geq .257$, or within the no-salience-control-condition, r_ss ≤ -.11, $p \geq .417$. Therefore, the salience manipulation neither affected the responses of gambling behavior nor was severity of gambling associated with the salience manipulation.

In a second step, we controlled for gender and severity of gambling, measured by the SOGS, by including both variables as covariates in the MANOVA. Our pattern remained the same: There was a significant difference in salience ratings[1] based on the salience conditions, $F(2, 114) = 24.74$, $p < .001$, Wilk's $\Lambda = .70$, $\eta_p^2 = .30$. Regarding the index of the prominence of properties[1], follow-up univariate analysis (ANOVA) revealed no difference between the low-chances-salient-condition and the no-salience-control-condition, $F(1, 115) = 0.03$, $p = .868$. Regarding the index of comparative distinctiveness[1], follow-up univariate analysis (ANOVA) revealed a significant difference, $F(1, 115) = 48.69$, $p < .001$, $\eta_p^2 = .30$.

Discussion

The findings from the preliminary study showed that we successfully manipulated the salience of low chances: Participants rated the slogan of the low chances of winning in the low-chances-salient-condition as prominent and noticeable. In addition, participants were more surprised and did not expect salient low chances on a slot machine; they also rated the salient chances of winning as not typical and unfamiliar and therefore as a novelty in the given context. Based on these findings, we assume that the prominence of the properties and the comparative distinction – the two dimensions of salience according to the definition of Higgins (1996) – were successfully manipulated in our low-chances-salient-condition. In Study 1, we used this manipulation of the low chances on a slot machine to investigate whether the myopic effect of alcohol could reduce gambling behavior.

Study 1: Alcohol Myopia and Gambling Persistence

Study 1 investigated the effect of alcohol on gambling behavior in a laboratory study, as this setting allows for control of confounding variables and therefore provides a higher internal validity than field studies. As previous research (Gainsbury, Russell, & Blaszczynski, 2014) revealed differences between a student and a gambler sample, we invited a sample of occasional gamblers to our lab. The authors found that students gamble less frequently, are at a lower risk for gambling-related problems, have more irrational beliefs and a more negative attitude towards gambling compared to a sample of gamblers recruited from the general population (Gainsbury et al., 2014). In our study, gamblers consumed either an alcoholic beverage or a placebo. However, all participants were told that they would consume alcohol. Comparing the effect of alcohol against a placebo-condition allowed us to investigate the pharmacological effect of alcohol while ruling out expectancy effects by holding the belief of consuming alcohol constant (Martin & Sayette, 1993). After consumption of the beverage, gamblers played on a computerized slot machine on which either the low chances of winning were highlighted (low-chances-salient-condition) or which resembled a commercial slot machine as a no-salience-control-condition (i.e., low chances not salient). We manipulated the salience of the low chances of winning by explicitly displaying the slogan “Chance of winning: 1/1000” in large letters on the computer screen. The slogan providing the gain “Win up to 300€” was displayed in small letters below. In the no-salience-control-condition – as customary on commercial slot machines and to keep the provided features and information concerning the chances of winning and the gain constant in both conditions – the slogan concerning the gain was displayed in large letters, and the slogan of the low chances of winning was displayed in small letters below.

We investigated the effect of alcohol on gambling behavior in the domain of slot machine gambling for the following reason: Slot machine gambling is the most addictive

form of gambling. C. Meyer et al. (2011) showed that slot machine gamblers have a 6.3 higher chance of developing a gambling addiction once in their lifetime compared to all other forms of gambling. In addition, almost every second pathological gambler (49.1%) named slot machines as the main cause of his or her gambling problems (C. Meyer et al., 2011). One reason for the high number of slot machine gamblers that are addicted seems to be structural characteristics of the machines, for example the immediacy of reinforcement (operant conditioning; Choliz, 2010), illusion of control through pushing buttons (Choliz, 2006), “near-misses” or “near-wins” foster the appearance of cognitive bias (Griffiths, 1994), the possibility of playing with a low stake, and aural as well as visual accentuation in the case of a win (Fisher & Griffiths, 1995). Therefore, the reduction of gambling behavior in the domain of slot machine gambling would be crucial for the development of preventions of problematic and pathological gambling.

We hypothesized that by making the low chances of winning salient, intoxicated gamblers (alcohol-low-chances-salient-condition) should focus on the low chances of winning through alcohol-induced myopia and this should lead them to gamble less persistently compared to sober participants (placebo-low-chances-salient-condition) and compared to participants in the no-salience-control-conditions (alcohol-no-salience-control-condition and placebo-no-salience-control-condition; i.e., low chances of winning not salient). Comparing the effect of the alcohol-low-chances-salient-condition against the placebo-low-chances-salient-condition allowed us to investigate whether the myopic effect of alcohol on low chances of winning would reduce gambling behavior. In addition, comparing the effect of the alcohol-low-chances-salient-condition with each of the no-salience-control-conditions (alcohol-no-salience-control-condition and placebo-no-salience-control-condition) allowed us to investigate (a) whether alcohol in general decreases gambling behavior or only when low chances of winning are salient, and (b) whether making the low chances salient

would be effective for intoxicated participants in reducing gambling in comparison to "normal" conditions in which gamblers – either intoxicated or sober – are usually faced with. Meaning slot machines on which the gain is highlighted and the low chances of winning are not salient.

Method

Participant Recruitment, Screening, and Design

We recruited 128 participants (50 women, 78 men, M_{age} = 26.72, *SD* = 6.17, age range: 19 – 61 years) through an advertisement on the internet and with flyers for a study on "alcohol and perception". To distract participants from the true aim of the study, participants were told that the study focused on the effect of alcohol on perception. They were also told that they would consume a certain amount of alcohol during a movie and then they had to answer several questions regarding this movie. In addition, participants were informed that after the end of the experiment they had to stay in the lab until their BAC would have dropped below .025%. During this time, they could either participate in a second study on "individual preferences in games", in which they would test a new slot machine game and could keep the money won, or they could stay in a separate waiting room, in which snacks and magazines were provided. We applied this procedure in reference to previous studies on alcohol and gambling behavior (Cronce & Corbin, 2010; Kyngdon & Dickerson, 1999). Of the 128 participants, 120 decided to take part in the supposedly second study and played on the slot machine.

Based on earlier studies where making low expectations salient led intoxicated (vs. sober) participants to attach themselves less to a goal (Sevincer & Oettingen, 2014; Sevincer et al., 2012), we aimed for a sample size of 30 participants per group. Screening measures were conducted by telephone. Inclusion criteria were (a) absence of high-risk level of alcohol consumption: score lower than 5 on the Brief Michigan Alcoholism Screening Test (B-

MAST; Pokorny, Miller, & Kaplan, 1972), (b) absence of pathological gambling: score lower than 5 on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), (c) at least 18 years of age, (d) no medication that contraindicates alcohol administration, (e) no possible pregnancy, and (f) engagement in one or more forms of gambling at least once over the last 3 months. Eligible participants were instructed to refrain from eating for 4 hours, from consuming alcohol during the preceding 12 hours prior to the experiment and to bring identification card. Prior to the scheduled testing date (at least 3 days before), participants had to fill out an online questionnaire with which we assessed potentially confounding variables (described below). We measured these potentially confounding variables because they may be related to our dependent variable (gambling persistence) to statistically account for their impact. The reason for assessing these variables as potentially confounding variables is described below. In addition, participants were informed that they will consume alcohol and that they must not drive to the experiment. They were paid 8,50€ for each hour of participation, and they could keep the money gained in the gambling task. The experiment was approved by the ethics commission of the German Medical Association. Participants were randomly assigned to one of the four conditions: alcohol-low-chances-salient-condition, placebo-low-chances-salient-condition, alcohol-no-salience-control-condition, placebo-no-salience-control-condition.

Screening questionnaires. The SOGS (Lesieur & Blume, 1987) was used to identify participants with problematic or pathological gambling in this study. It consists of 16 items (e.g., “When you gamble, how often do you go back another day to win back money you lost?”). Scores can be achieved between 0 and 20, whereby a score of 3 or 4 serves to identify problematic gambling; a score of 5 or higher points to probable pathological gambling. In the current study, participants with a score of 5 or higher were excluded. We used the questionnaire in the German translation (Müller-Spahn & Margraf, 2003).

The B-MAST (Pokorny et al., 1972) in the German version (Rumpf, Hapke, & John, 2010) was used to assess alcohol abuse. The self-report questionnaire, which consists of 10 items (e.g., “Have you ever gotten into trouble at work because of drinking?”), screens for lifetime alcohol-related problems and alcoholism. A score of 4 is used to identify probable alcoholism; a score of 5 or higher points to alcoholism. In the current study, participants with a score of 5 or higher were excluded.

Confounding variables. We assessed the following questionnaires[2] to control for drinking habits, socially desirable responding, severity of gambling as well as individual differences in personality and their influence on persistent gambling: The Personal Drinking Habits Questionnaire (PDHQ; Vogel-Sprott, 1992), the Behavioral Inhibition/Behavioral Activation Scale (BIS/BAS; Carver & White, 1994), the UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001), the Big-Five-Inventory (BFI-10; Rammstedt, Kemper, Klein, Beierlein, & Kovaleva, 2012), and the Brief Scale of Social Desirability Gamma (KSE-G; Kemper, Beierlein, Bensch, Kovaleva, & Rammstedt, 2012). Participants filled out the questionnaires several days before the experiment (at least 3 days before the scheduled testing date). They received a personalized hyperlink with which they could answer the online questionnaire.

The PDHQ (Vogel-Sprott, 1992) was assessed to control for differences in drinking habits because through frequent alcohol consumption, people may develop a tolerance to alcohol (Vogel-Sprott & Fillmore, 1999) and therefore could attenuate the alcohol-induced myopic effect of alcohol and salient low chances on gambling behavior. In the PDHQ questionnaire, participants are asked to report the frequency (number of days of alcohol consumption per week), quantity (i.e., dose = volume of absolute alcohol (ml) per kg body weight consumed on a typical day of alcohol consumption), and duration of their typical alcohol use (measured in hours). We calculated a score of drink rate by dividing the dose

consumed on a typical drinking occasion by the duration of this occasion to obtain a measure of individuals' current drinking habits.

The BIS/BAS Scale (Carver & White, 1994) depicts a self-report questionnaire which measures people's sensitivity to reward through the behavioral approach system (BAS) and their sensitivity to punishment through the behavioral inhibition system (BIS). The questionnaire consists of four subscales with 24 Items: BAS – fun seeking (e.g., "I'm always willing to try something new if I think it will be fun."), BAS – reward responsiveness (e.g., "When I'm doing well at something I love to keep at it."), BAS – drive (e.g., "I go out of my way to get things I want."), and BIS (e.g., "I feel pretty worried or upset when I think or know somebody is angry at me."). Agreement to the statements is given on a 4-point scale from 1 (*very true for me*) to 4 (*very false for me*). Since previous research found that pathological gamblers demonstrated higher BIS and BAS scores compared to a healthy control group (Rahman, Xu, & Potenza, 2014), we intended to control for these differences. The German version (Strobel, Beauducel, Debener, & Brocke, 2001) possesses acceptable psychometric properties for the BAS scale (Cronbach's $\alpha = .81$) and for the BIS scale (Cronbach's $\alpha = .78$). In our sample of Study 1, the BIS scale showed a high internal consistency (Cronbach's $\alpha = .83$); the BAS scale showed an acceptable internal consistency (Cronbach's $\alpha = .71$).

The UPPS Scale (Whiteside & Lynam, 2001) measures four facets of impulsivity and consists of 45 items: urgency (e.g., "In the heat of an argument, I will often say things that I later regret."), premeditation (e.g., "I usually make up my mind through careful reasoning."), perseverance (e.g., "I generally seek new and exciting experiences and sensations."), and sensation seeking (e.g., "I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional."). The given statements are rated on a 4-point Likert scale ranging from 1 (*strongly agree*) to 4 (*strongly disagree*). Previous research found

that pathological gamblers showed enhanced impulsivity scores compared to non-pathological gamblers (Bagby et al., 2007; Loxton, Nguyen, Casey, & Dawe, 2008; Potenza et al., 2003). In addition, the severity of pathological gambling was found to be correlated with impulsivity scores (Blanco et al., 2009). Based on these findings we assessed and controlled for different impulsivity scores. The psychometric scores for the German version (R. E. Schmidt, Gay, d'Acremont, & Linden, 2008) are good (Cronbach's αs between .80 and .85 for the four subscales). In our sample of Study 1, the internal consistency for the four subscales was also acceptable (Cronbach's αs between .72 and .85).

The BFI-10 (Rammstedt et al., 2012) assesses the Big Five Dimension of Personality in a short 10-item questionnaire. Each dimension is measured by two items: extraversion (e.g., "I see myself as someone who is outgoing, sociable."), agreeableness (e.g., "I see myself as someone who is generally trusting."), conscientiousness (e.g., "I see myself as someone who does a thorough job."), neuroticism (e.g., "I see myself as someone who gets nervous easily."), openness (e.g., "I see myself as someone who has an active imagination."). Participants answer on a 5-point Likert scale ranging from 1 (*disagree strongly*) to 5 (*agree strongly*). We assessed the BFI-10 because previous research found lower scores on conscientiousness (Bagby et al., 2007) and higher scores on neuroticism in pathological gamblers compared to non-pathological gamblers (Bagby et al., 2007; Potenza et al., 2003). Neuroticism was also found to be a predictor of pathological gambling (Myrseth, Pallesen, Molde, Johnsen, & Lorvik, 2009). Rammstedt and John (2007) reported sufficient psychometric properties for this short version with a test-retest reliability of $r_{tt} = .75$. In our sample of Study 1, the internal consistency of the five subscales was as followed: extraversion (Cronbach's $\alpha = .71$), neuroticism (Cronbach's $\alpha = .59$), openness (Cronbach's $\alpha = .63$), conscientiousness (Cronbach's $\alpha = .49$), and agreeableness (Cronbach's $\alpha = .12$). Due to the unacceptable internal consistency (Cronbach's $\alpha < .50$) of the conscientiousness

and the agreeableness scales and since we were particularly interested in the personality traits conscientiousness and neuroticism, we only included the personality trait neuroticism for further analyses.

The KSE-G scale (Kemper et al., 2012) depicts a self-report measure of socially desirable responding. The questionnaire consists of six items with two subscales: enhancement (PQ+), meaning promoting positive qualities, (e.g., “In an argument, I always remain objective and stick to the facts.”) and denial (NQ-), meaning disavowing negative qualities, (e.g., “It has happened that I have taken advantage of someone in the past.”). Agreement to the statements is given on a 5-point scale ranging from 0 (*doesn’t apply at all*) to 4 (*applies completely*). Because we screened and tested participants regarding socially undesirable domains (alcohol consumption and gambling behavior), we assessed the questionnaire to exclude participants with high scores (i.e., 1 *SD* above the mean of the validation study, N = 566; Kemper et al., 2012) on either of the two subscales. The psychometric properties of the KSE-G are sufficient (PQ+ scale: Cronbach’s $\alpha = .71$; NQ- scale: Cronbach’s $\alpha = .78$); criteria of factorial validity were met suggesting the questionnaire to be a valid and reliable for measuring socially desirable responding (Kemper et al., 2012). However, in our sample of Study 1, the PQ+ scale yielded an unacceptable internal consistency (Cronbach’s $\alpha = .45$); the NQ- scale also showed an unacceptable internal consistency (Cronbach’s $\alpha = .48$). Therefore, due to the unacceptable internal consistency ($\alpha < .50$) of the two subscales, the questionnaire was not used to identify participants with high scores regarding socially desirable responding.

In addition, we intended to control for severity of gambling (measured by the SOGS) since participants who gamble on a frequent basis might also gamble more persistently in the gambling task provided in the experiment. However, in our sample of Study 1, the SOGS

showed an unacceptable internal consistency (Cronbach's $\alpha = .40$). Therefore, the SOGS were excluded from further analyses.

We also controlled for the possible influence of gender since men gamble more frequently than women (Bundeszentrale für gesundheitliche Aufklärung, 2010) and they enjoy games of chance more than women (G. Meyer & Bachmann, 2011). We assumed that men, therefore, might display a higher preference for games of chance which might be associated with increased gambling persistence (dependent variable).

Experimental Procedure

The experimental sessions were run individually between noon and 8 p.m. At arrival at the laboratory participants were informed about the procedure and signed informed consent. Then, their weight and height were taken, and initial breath alcohol levels were measured using Alcotest 6510 (Dräger, n.d.) to ensure sobriety before the onset of the experiment. For the alcohol-condition, participant's weight, sex, height, and age were used to calculate the dose required to achieve a BAC of .06%. The respective dose was computed using a formula based on G. Schmidt (n.d.). Pregnancy tests were conducted for all female participants to ensure that they were not pregnant; there were no positive or ambiguous results.

Beverage administration. The beverage administration followed a procedure which was successfully used in a study of Sevincer and Oettingen (2009) and Sevincer et al. (2012) and was adopted from Martin and Sayette (1993). Participants were randomly assigned to either the alcohol or placebo-condition. By comparing the effect of alcohol on gambling behavior against a placebo-condition, it is possible to investigate the pharmacological effect of alcohol while ruling out expectancy effects by holding the belief of consuming alcohol constant (Martin & Sayette, 1993). Therefore, all participants were told that they would consume alcohol.

In the alcohol-condition, the bottle contained real vodka (Arapow, 40%) and was labeled as such; in the placebo-condition, the same labeled bottle was filled with flattened tonic water (Schweppes) instead of vodka. Additionally, in the placebo-condition, glasses were sprayed with vodka from a perfume vaporizer directly prior to the experiment to enhance credibility by simulating the taste and smell of an alcoholic beverage. Drinks were mixed in full sight of participants in a graduated cylinder. The beverage contained a 1:5 mixture of vodka to tonic water and was then poured into four glasses. Participants were given 10 minutes to finish each glass. While consuming the beverage participants watched a movie about traveling in Austria (Bayrischer Rundfunk, 2009) which lasted 60 minutes. Every 10 minutes a tone sounded, which was added to the movie, to remind participants to finish the glass they were drinking and start with the next. At the end of the movie, since we used a cover story for the study, participants had to answer several recall questions regarding the content of the movie. Following the last drink and a 20-minute absorption period, participants rinsed their mouths with water and their breath alcohol levels were assessed a second time. Participants in the alcohol-condition were shown their actual BAC; participants in the placebo-condition were shown a random BAC of around .06%.

Placebo manipulation check. Participants had to answer self-report ratings concerning their subjective effects of the beverage. Participants indicated on a 10-point scale how intoxicated they felt and how strongly they experienced pharmacological effects ranging from 1 (*not at all*) to 10 (*very*). Additionally, they had to estimate the amount of alcohol consumed equivalent in bottles of beer ("Please estimate the amount of alcohol consumed in bottles of beer").

Thereafter, they were told that the study had ended and that they had to remain in the lab until their BAC dropped below .025%. We offered them the chance to take part in a

second study on “individual preferences in games”, in which they could test a new slot machine game and could win a certain amount of money.

Slot machine game. We developed a simulated computerized slot machine game based on commercial slot machine models and on a slot machine game used in previous studies (Choliz, 2010). The slot machine featured three reels with six symbols (orange, the number *seven*, the word *BAR*, cloverleaf, lemon, cherry) in the middle and below in one line the current credit and in another line the current stake of each spin. By pressing a button the reels started to turn, and by pressing the button a second time, the reels stopped in succession and showed a random combination of the symbols. Additionally, sensory features – the clatter of the reels, a sound of money payout in case of a win, and a single tone in case of a loss – were added.

Participants were told that the slot machine was preloaded with 5€, they could play with this amount for as long as they desired, and that they could quit anytime and keep the remaining money. Participants were also informed that they would receive the 5€ that were preloaded on the machine if they decided not to gamble. This procedure was successfully employed in a previous study on alcohol and gambling (Cronce & Corbin, 2010). Of the 128 participants, 120 decided to gamble; of the eight participants who did not agree to gamble, four had consumed the alcoholic and four the placebo beverage. Participants who chose not to gamble were allowed to stay in the waiting room where we offered snacks and magazines. The remaining participants were then presented with the machine. Each game cost 0.10€, and this amount was subtracted from the current credit. In the case of a win (three identical symbols: orange, the word *BAR*, cloverleaf, lemon, cherry), the current credit increased by 0.20€. Participants were told that they had a 1/1000 chance of winning the jackpot of 300€ in the case of three identical symbols of the number *seven* appearing. Although participants were able to stop the reels by pushing a button, they had no control over the outcome. The

programming of the computerized slot machine enabled us to rig the win and loss trials so that every participant ran through the same win and loss sequence. Participants could play a maximum of 70 games with their 5€; wins occurred at trials 3, 8, 12, 15, 20, 28, 35, 40, 50, and 59. Hence, the win rate decreased with each trial, and the more participants played, the more they lost.

To manipulate the salience of the low chances of winning, in the low-chances-salient-condition, the slogan “Chance of winning 1/1000” was explicitly displayed on the upper part of the slot machine. The slogan providing the gain “Win up to 300€” was displayed in small letters below. In the no-salience-control-condition, the screen of the computerized slot machine resembled a commercial slot machine by displaying the slogan concerning the gain in large letters and the slogan of the low chances of winning was displayed in small letters below (i.e., chances of winning are not made salient; Figure 2). The salience manipulation was tested in our preliminary study and findings showed that the highlighted low chance of winning was salient through its prominence of properties and through its comparative distinction. Therefore, we assumed our salience manipulation as successful. As dependent variable, we measured the number of trials played on the slot machine and the amount of money lost as an indicator for persistence in gambling.

Low subjective chances of winning. To examine whether participants estimated their subjective chances as low and the potential gain as attractive, after they saw the machine but before they started to gamble, we assessed the attractiveness of winning the jackpot (“How attractive is the jackpot to you?”), and the height of the estimated chances (“How high do you estimate your chances to win the jackpot?”) on a 7-point scale ranging from 1 (*very unattractive* and *very low*, respectively) to 7 (*very attractive* and *very high*, respectively). In addition, to examine whether making low chances salient lowers intoxicated participants’ subjective chances of winning and in this way may reduce their persistence in gambling, we

measured the height of the estimated chances a second time after they had gambled using the same item. The experiment ended with further demographic items assessing employment and native language.

After completing the experimental procedure, participants were probed for suspicion and thanked for their participation. They were then fully debriefed, and they were requested to keep the purpose of the study confidential until the data collection was completed. Participants in the placebo-condition were free to leave the laboratory, whereas participants in the alcohol-condition were only permitted to leave after their BAC dropped below .025%. They were offered snacks and water and were encouraged to stay in the laboratory until they were completely sober. Before leaving, we reminded them not to drive for up to 6 hours after the end of the experiment. Both groups were paid the corresponding amount of money they had earned (8,50€ for each hour of participation and the amount they had won in the gambling task).

Results

Preliminary Analyses

We conducted a series of one-way analyses of variances (ANOVAs) to confirm equal distribution of demographic and further variables across the four experimental groups. Participants in the four conditions did not differ on the following variables: age, $F(3, 116) = 1.71$, $p = .168$, drinking habits (measured by the PDQH), $F(3, 116) = 0.89$, $p = .449$, and severity of gambling (measured by the SOGS), $F(3, 116) = 0.73$, $p = .538$. Chi-square analysis revealed no significant difference in gender distribution between the four conditions, $\chi^2(3) = 5.45$, $p = .141$.

Blood Alcohol Content

All participants in the study had a BAC of .00% before the onset of the experiment. Participants in the alcohol-condition reached an average BAC of .053% ($SD = .010$). There

was no difference between the alcohol-low-chances-salient-condition and the alcohol-no-salience-control-condition in participants' BAC $t(55) = 0.53$, $p = .598$. We excluded two participants who were not able to consume the corresponding amount of alcohol which resulted in a too low BAC.

Placebo Manipulation Check

Two participants in the placebo-condition reported not having consumed any alcohol during the experiment and were therefore excluded from subsequent analyses following the recommendation of Martin and Sayette (1993). Participants who received alcohol felt more intoxicated ($M = 5.11$, $SD = 2.38$) compared to participants who received a placebo ($M = 2.19$, $SD = 1.94$), $t(114) = 7.22$, $p < .001$, Cohen's $d = 1.35$. In addition, participants who received alcohol experienced more pharmacological effects ($M = 6.11$, $SD = 2.45$) compared to participants who received a placebo ($M = 2.61$, $SD = 2.04$), $t(114) = 8.36$, $p < .001$, Cohen's $d = 1.55$; they also estimated a higher amount of alcohol consumed equivalent in bottles of beer ($M = 4.49$, $SD = 1.97$) compared to participants who received a placebo ($M = 3.43$, $SD = 1.58$), $t(114) = 3.20$, $p = .002$, Cohen's $d = 0.59$. However, since all remaining participants in the placebo-condition reported having consumed at least one alcoholic beverage and previous studies on moderate alcohol doses reported similar findings (Martin & Sayette, 1993), we assumed our placebo manipulation as successfully employed.

Low Subjective Chances of Winning

Subjectively estimated height of chances of participants was below the midpoint of the scale ($M = 1.94$, $SD = 1.43$) before gambling, suggesting that participants indeed estimated their chances as low. The attractiveness of the jackpot indicated by the participants was above the midpoint ($M = 5.63$, $SD = 1.61$). The subjective height of chances as well as the attractiveness of the jackpot did not differ between the four conditions, Fs ≤ 1.92, ps $\geq .130$.

Persistence in Gambling

We measured number of trials played and amount of money lost as an indicator for persistent gambling. Because money lost was a function of number of trials played, the variables were highly correlated ($r = .99$, $p < .001$). Hence, the absence of multicollinearity assumption of the MANOVA would have been violated, and therefore we conducted two separate ANOVAs.

Number of trials played. The total number of trials played across conditions ranged from 2 to 70 with an average of 23.80 ($SD = 1.79$) trials. To test our specific predictions, we conducted three a priori between-subject planned comparisons (non-orthogonal) with number of trials played as dependent variable in reference to Furr and Rosenthal (2003). We predicted that (a) when low chances were made salient, intoxicated participants would play fewer trials than sober participants (alcohol-low-chances-salient-condition vs. placebo-low-chances-salient-condition), (b) intoxicated participants would play fewer trials when low chances were made salient but not when they were *not* salient (alcohol-low-chances-salient-condition vs. alcohol-no-salience-control-condition), and (c) when low chances were made salient but not when they were *not* salient, intoxicated participants would play fewer trials than sober participants (alcohol-low-chances-salient-condition vs. placebo-no-salience-control-condition). To sum up, intoxicated participants (alcohol-low-chances-salient-condition) should play fewer trials than each of the other three groups (placebo-low-chances-salient-condition, alcohol-no-salience-control-condition, placebo-no-salience-control-condition).

Since the assumption of homogeneity of variance was found to be violated through Levene Test, $p < .001$, hypotheses tests were based on unequal variances. As predicted, a significant effect of condition on gambling persistence was found for the first comparison which contrasted the alcohol-low-chances-salient-condition with the placebo-low-chances-

salient-condition: Participants in the alcohol-low-chances-salient-condition played fewer trials (M = 29.18, SD = 13.33) compared to participants in the placebo-low-chances-salient-condition (M = 43.41, SD = 26.46), indicating that when low chances were made salient, intoxicated participants played less persistently than sober participants, $t(41.67) = 2.58$, $p = .014$, Cohen's $d = 0.68$. This finding suggests that by highlighting low chances, intoxicated participants focused more on the low chances of winning and less on the gains through alcohol-induced myopia and this led participants to gamble less persistently. On the contrary, sober participants were able to perceive and process all given information and their gambling persistence was not affected by salient low chances.

The second comparison contrasted the alcohol-low-chances-salient-condition with the alcohol-no-salience-control-condition. Again we found a significant effect: Participants in the alcohol-low-chances-salient-condition played fewer trials (M = 29.18, SD = 13.33) compared to participants in the alcohol-no-salience-control-condition (M = 44.34, SD = 25.64), indicating that intoxicated participants played less persistently when low chances were made salient but not when they were *not* salient, $t(42.43) = 2.82$, $p = .007$, Cohen's $d = 0.74$. This finding suggests that alcohol only reduced gambling persistence when low chances were made salient but not under normal gambling conditions (i.e., gain is highlighted, and low chances are not salient), indicating that when no salience manipulation was applied, intoxicated participants were still able to process all given information regarding the gain and the low chances of winning.

Finally, the alcohol-low-chances-salient-condition was contrasted with the placebo-no-salience-control-condition. We found a marginally significant effect: Participants in the alcohol-low-chances-salient-condition tended to play fewer trials (M = 29.18, SD = 13.33) compared to participants in the placebo-no-salience-control-condition (M = 39.53, SD = 25.08), indicating when low chances were made salient but not when they were *not*

salient, intoxicated participants tended to play less persistently than sober participants, $t(44.81) = 1.98$, $p = .054$, Cohen's $d = 0.52$, (Figure 3a). This finding suggests that making the low chances salient seemed to be effective for intoxicated participants in reducing gambling persistence in comparison to normal conditions in which gamblers – either intoxicated or sober – are usually faced with. Meaning slot machines on which the gain was highlighted and low chances of winning were not made salient. See Table 2a for means and standard deviations for the dependent variable number of trials played for each group.

Money lost. The total amount of money lost across conditions ranged from 0.20€ to 5.00€ with an average of 2.63€ ($SD = 1.79$). Since the assumption of homogeneity of variance was found to be violated through Levene Test, $p < .001$, hypotheses tests were based on unequal variances.

Because money lost was a function of number of trials played, the pattern mirrored the pattern of number of trials played. As predicted, a significant effect was found for the first comparison which contrasted the alcohol-low-chances-salient-condition with the placebo-low-chances-salient-condition: Participants in the alcohol-low-chances-salient-condition lost less money ($M = 1.81$, $SD = 0.98$) compared to participants in the placebo-low-chances-salient-condition ($M = 2.99$, $SD = 1.97$), indicating that when low chances were made salient, intoxicated participants played less persistently than sober participants, $t(41.29) = 2.90$, $p = .006$, Cohen's $d = 0.76$.

The second comparison contrasted the alcohol-low-chances-salient-condition with the alcohol-no-salience-control-condition. We found a significant effect: Participants in the alcohol-low-chances-salient-condition lost less money ($M = 1.81$, $SD = 0.98$) compared to participants in the alcohol-no-salience-control-condition ($M = 3.04$, $SD = 1.92$), indicating that intoxicated participants played less persistently when low chances were made salient but not when they were *not* salient, $t(41.86) = 3.06$, $p = .004$, Cohen's $d = 0.81$.

Finally, the alcohol-low-chances-salient-condition was contrasted with the placebo-no-salience-control-condition. We found a significant effect: Participants in the alcohol-low-chances-salient-condition lost less money (M = 1.81, SD = 0.98) compared to participants in the placebo-no-salience-control-condition (M = 2.65, SD = 1.87), indicating when low chances were made salient but not when they were *not* salient, intoxicated participants played less persistently than sober participants, $t(44.34) = 2.19$, $p = .034$, Cohen's $d = 0.56$, (Figure 3b). See Table 2b for means and standard deviations for the dependent variable money lost for each group.

Alternative Explanation: Changes in Subjective Chances of Winning

A mixed-design ANOVA with measurement time (before to after gambling) as within-subjects factor and the four experimental groups (alcohol-low-chances-salient-condition, placebo-low-chances-salient-condition, alcohol-no-salience-control-condition, placebo-no-salience-control-condition) as between-subjects factors was used to examine whether making low chances salient lowers intoxicated participants' subjective chances of winning. We observed a significant main effect: Estimated chances of winning[1] decreased from before (M = 1.94, SD = 1.43) to after participants gambled (M = 1.61, SD = .94), $F(1, 111) = 7.64$, $p = .007$, $\eta_p^2 = .06$, indicating that the salience manipulation did not affect participants' estimated chances in the four groups differently. Since participants were losing more over time due to a decreased winning rate, this finding comes as no surprise.

Confounding Variables

Adding the potentially confounding variables as covariates (BFI-10 – personality trait neuroticism, UPPS Scale, BIS/BAS Scale, PDHQ, and gender) in the ANOVA did not change the pattern of findings[3]. The results of the three planned comparisons which contrasted the alcohol-low-chances-salient-condition with each of the three other conditions (placebo-low-chances-salient-condition, alcohol-no-salience-control-condition, placebo-no-

salience-control-condition) remained the same: A significant effect of condition on gambling persistence was found for the first comparison which contrasted the alcohol-low-chances-salient-condition with the placebo-low-chances-salient-condition, $p = .011$, 95% Cl [3.80, 28.43] and for the second comparison which contrasted the alcohol-low-chances-salient-condition with the alcohol-no-salience-control-condition, $p = .012$, 95% CI [3.47, 27.37]. A marginally significant effect was found for the third comparison which contrasted the alcohol-low-chances-salient-condition with the placebo-no-salience-control-condition, $p = .072$, 95% CI [-0.99, 23.07]. Thus, our effect of salient low chances on gambling behavior in intoxicated gamblers remained significant when controlling for individual differences in personality (i.e., personality trait neuroticism, impulsivity, sensitivity to reward and punishment), gender, and drinking habits.

Discussion

Consistent with the proposed hypotheses, we observed that making low chances salient led intoxicated occasional gamblers to gamble less persistently and to lose less money than sober occasional gamblers. Therefore, it seems that alcohol-induced myopia led participants to focus on the low chances of winning and this enabled occasional gamblers to reduce their gambling behavior. Intoxicated occasional gamblers also gambled less persistently when the low chances were salient compared to each of the no-salience-control-conditions (alcohol-no-salience-control-condition and placebo-no-salience-control-condition). Making low chances salient, therefore, seems to be effective for intoxicated participants in reducing gambling persistence in comparison to conditions in which gamblers – sober as well as intoxicated – are usually faced (i.e., gain highlighted and low chances of winning not salient). By measuring subjectively estimated chances of winning the jackpot before and after gambling, we could rule out the alternative explanation that our salience manipulation affected gamblers' estimated chances in the four experimental groups

differently. Moreover, our effect of salient low chances on gambling behavior in intoxicated gamblers remained significant when controlling for individual differences in personality (i.e., personality trait neuroticism, impulsivity, sensitivity to reward and punishment), gender, and drinking habits. Study 1, therefore, suggests that making low chances salient on slot machines could be an effective (medium effect size) tool to reduce gambling persistence in intoxicated occasional gamblers.

However, escalated gambling may also include an increase in risky choices. We, therefore, aimed to replicate our findings in the domain of risk-taking in Study 2. In addition, Study 1 revealed only indirect evidence that intoxicated participants paid more attention to the salient low chances since we tested the direct effect of salience manipulation on gambling persistence. Hence, the precise mechanism of how alcohol-induced myopia affects attentional processes and in turn gambling behavior remains unclear. Therefore, in Study 2, we recorded participants' eye movements while gambling to examine the myopic effect of alcohol on attentional processes in greater detail.

Study 2: Alcohol Myopia and Risk-Taking

The aim of Study 2 was twofold: First, Study 1 investigated the effect of alcohol on gambling persistence. However, escalated gambling may also involve increased risk-taking. Therefore, in Study 2, we aimed to replicate our findings in the domain of risk-taking. Second, Study 1 revealed only indirect evidence that intoxicated participants focused longer on the salient low chances and this led participants to gamble less persistently since we tested the direct effect of the salience manipulation on gambling behavior. Therefore, in Study 2, we aimed to investigate the precise mechanism of how alcohol-induced myopia affects attentional processes and whether these attentional processes account for the association between alcohol and risk-taking.

To address the first goal (i.e., replicate the findings of Study 1 in the domain of risk-taking), we adapted a version of a widely used gambling task (i.e., random lottery pair paradigm) that allowed us to manipulate the salience of low chances to measure risk-taking in gambling. Risk-taking depicts one crucial characteristic of gambling behavior besides gambling persistence (G. Meyer & Bachmann, 2011). Gambling persistence refers to the period spent on gambling and can be measured in total number of trials played (e.g., Cronce & Corbin, 2010; Kyngdon & Dickerson, 1999) or time spent gambling (e.g., Blanco, Petkova, Ibáñez, & Sáiz-Ruiz, 2002; Hraba & Lee, 1996); risk-taking refers to choices made while gambling and can be measured in the amount wagered (Kyngdon & Dickerson, 1999), "power betting" (i.e., to double a wager after seeing the first two cards of five in a video poker game; Ellery & Stewart, 2014; Ellery, Stewart, & Loba, 2005), or the preference to gamble with a larger prize at a lower winning probability over a smaller prize at a higher winning probability (Fiedler & Glöckner, 2012; Harrison & Rutstrom, 2008; Hey & Orme, 1994; Lane et al., 2004). This latter measurement of risk-taking is known as the random lottery pair paradigm. In this paradigm, a series of lottery pairs are presented that vary in the amount of gains and winning probabilities. In each pair, one lottery has a lower gain with a higher chance of winning – this lottery ticket represents the non-risky option. The other lottery has a higher gain with a lower chance of winning – this lottery ticket represents the risky option and is considered as an indicator for risk-taking. We adapted this paradigm and manipulated the low chances of winning by highlighting the slogan concerning the low chances of winning.

To address the second goal (i.e., investigate the precise mechanism of how alcohol affects attentional processes), we used an eye-tracker to measure visual attention while gambling. According to alcohol myopia theory, alcohol narrows attention through limiting the amount of cues that can be perceived and the ability to process these cues which then

restricts the attentional focus to the most salient cues. Although alcohol myopia theory makes assumptions about these attentional processes, the precise mechanism of how alcohol-induced myopia affects attention has not been studied in greater detail. To our knowledge, only two studies exist which investigated whether the alcohol-induced attentional processes proposed by alcohol myopia theory account (i.e., mediate) for the effect of alcohol on the respective social behavior. In one study, the authors replicated the findings of Giancola and Corman (2007) that intoxicated participants who were provoked showed less aggression when they were distracted from the provocative cue compared to intoxicated participants who were not distracted (Gallagher & Parrott, 2011). Beyond the data replication, they found that distracted, intoxicated participants also displayed less attention allocation to aggressive stimuli (i.e., slower responses to aggression-related words relative to neutral words) compared to the intoxicated, non-distracted participants. However, the mediation analysis failed to reach statistical significance which tested whether the lower attentional bias to aggression-related words accounted for the association between alcohol and lower levels of aggression in intoxicated, distracted men. In a second study, Sher et al. (2007) replicated the findings of Josephs and Steele (1990) that intoxicated (vs. sober) participants expressed lower levels of anxiety, measured by self-reported anxiety and physiological measures (i.e., heart rate and skin conductance level), when their attention was distracted from a stress-evoking cue (i.e., giving a speech). In addition, they observed that impaired sustained attention (i.e., maintaining attention over a longer period of time) accounted for the effect of alcohol on skin conductance – however, no effect of alcohol on anxiety mediated by attention was found for the other two dependent variables (heart rate and self-reported anxiety).

Given the inconsistent findings of the previous studies on the effect of alcohol myopia on attentional processes, in Study 2, we aimed to investigate the proposed effect of alcohol myopia on attention by measuring visual attention on salient cues and whether this increased

visual attention accounts for the effect of alcohol on gambling behavior. Recent findings of studies on the effect of alcohol on visual attention can be interpreted in the light of alcohol myopia theory: For example, intoxicated participants focused their attention longer on central information in a high-salience visual scene compared to sober participants (central cue salient – police violence scene), but no increased attention on the central information was found in a low-salience visual scene (central cue not salient – busking scene; Harvey, Kneller, & Campbell, 2013a). In addition, a medium dose of alcohol led to longer fixations on scene areas of high semantic interest (i.e., salient – traffic scene) and therefore reducing the amount of time to focus more on peripheral areas compared to the sober control condition. This difference did not emerge in a scene without areas of high interest (i.e., not salient – classical kitchen scene; Moser, Heide, & Kömpf, 1998).

Therefore, in Study 2, we aimed to address this research gap by measuring the effect of alcohol on attentional processes while gambling and whether these attentional processes account for the effect of alcohol on gambling behavior. In Study 2, we followed the same procedure as in Study 1. But unlike in Study 1, where we recruited people who gambled occasionally (i.e., engagement in one or more forms of gambling at least once over the last 3 months), in Study 2, we recruited people from the general population without explicit prior knowledge of gambling to explore whether we could replicate our findings from Study 1 with a different sample. We screened participants for high-risk level of alcohol consumption and pathological gambling by telephone, they were then invited to our lab and consumed either an alcoholic beverage or a placebo. Thereafter, we asked them to participate in a supposedly second study on “individual preferences in games” in which participants were told that a lottery game would be tested. In this supposedly second study participants had to make 25 choices of lotteries presented in pairs. As an indicator for risk-taking, we assessed the number of risky gambling choices (i.e., the preference to gamble with a larger prize at a lower

winning probability over a smaller prize at a higher winning probability). In addition, while participants made their choices we examined whether they focused their attention on cues related to the gains and the chances of winning by using an eye-tracker which is a widely used method to measure visual attention (e.g., Brandstätter & Körner, 2014; Fiedler & Glöckner, 2012; Harvey, 2014; Harvey et al., 2013a; Harvey, Kneller, & Campbell, 2013b; Moser et al., 1998). As a manipulation check of the highlighted low chances of winning, we measured how long it took until participants gazed at the slogan pertaining to the low chances of winning (i.e., time to first fixation) to explore whether the low chances of winning were indeed salient and drew the attention of the participants. In addition, to investigate the myopic effect of alcohol more closely, we measured how long participants gazed at the slogans pertaining to the gains and the low chances of winning (i.e., fixation duration).

In the present study, we hypothesized that when the low chances of winning are salient, intoxicated participants (alcohol-low-chances-salient-condition) should make fewer risky choices compared to sober participants (placebo-low-chances-salient-condition) and compared to participants in the no-salience-control-conditions (alcohol-no-salience-control-condition, placebo-no-salience-control-condition). Furthermore, we predicted that the increased visual attention (longer fixation duration) on salient low chances mediates the myopic effect of alcohol on risky choices: In the low-chances-salient-condition, alcohol (vs. placebo) should lead to more visual attention on the low chances and to less attention on the gains, which should, in turn, predict reduced risk-taking in the lottery game. This mediated effect of increased attention on low chances should only emerge in the low-chances-salient-condition (alcohol-low-chances-salient-condition vs. placebo-low-chances-salient-condition) but not in the no-salience-control-condition (alcohol-no-salience-control-condition vs. placebo-no-salience-control-condition).

Method

Participant Recruitment, Screening, and Design

We recruited 120 participants (75 women, 45 men, M_{age} = 25.72, *SD* = 6.71, age range: 18 – 62 years) through advertisement on the internet as well as with flyers posted on the campus for a study on "alcohol and memory". As in Study 1, we used a cover story to distract participants from the true aim of the study. Participants were told that the study focused on the effect of alcohol on memory. They were also told that they would consume a certain amount of alcohol during a movie and then they had to answer several questions regarding this movie. In addition, participants were informed that after the end of the experiment, they had to stay in the lab until their BAC would have dropped below .025%. During this time they could either participate in a second study on "individual preferences in games", in which they would test a new lottery game and could keep the money won, or they could stay in a separate waiting room, in which snacks and magazines were provided. We applied this procedure in reference to previous studies on alcohol and gambling behavior (Cronce & Corbin, 2010; Kyngdon & Dickerson, 1999). Of the 120 participants, 117 decided to take part in the supposedly second study and played the lottery game.

Participants had to meet the same requirements as in Study 1 (at least 18 years of age, no medication that contraindicates alcohol administration, no possible pregnancy) except for the requirement that participants had to report that they engaged in at least one or more forms of gambling in the last 3 months. As in Study 1, participants were screened for high-risk level of alcohol consumption and pathological gambling by telephone using the same questionnaires (B-MAST, SOGS), and they had to fill out an online questionnaire, which contained potentially confounding variables (described below), at least 3 days before the scheduled testing date. We measured these potentially confounding variables because they may be related to our dependent variable (risk-taking in gambling) to statistically account for

their impact. The reason for assessing these variables as potentially confounding variables is described below.

Regarding experience in gambling, 82.1% indicated that they had gambled at least once in their lives and of this 82.1%, 22.9% reported that they had engaged in one or more forms of gambling at least once over the last 3 months. The experiment was approved by the ethics commission of the German Medical Association. Participants were randomly assigned to one of the four conditions (alcohol-low-chances-salient-condition, placebo-low-chances-salient-condition, alcohol-no-salience-control-condition, placebo-no-salience-control-condition).

Confounding variables. We used the same questionnaires (PDHQ, BFI-10, KSE-G) to control for drinking habits, socially desirable responding, severity of gambling as well as individual differences in personality and their influence on risky gambling as in Study 1 except for the following changes: Instead of the UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001) we used the shorter Barratt Impulsiveness Scale (BIS-15; Spinella, 2007) to measure the personality trait impulsivity. Additionally, we implemented the short scale for assessing willingness to take risk (R-1; Beierlein, Kovaleva, Kemper, & Rammstedt, 2015). As in Study 1, participants filled out the questionnaires online via a personalized hyperlink several days before the experiment (at least 3 days before the scheduled testing date).

As described in Study 1, the BFI-10 (Rammstedt et al., 2012) assesses the Big Five Dimension of Personality in a short 10-item questionnaire. We assessed the Big Five personality traits because previous research found lower scores on conscientiousness (Bagby et al., 2007) and higher scores on neuroticism in pathological gamblers compared to non-pathological gamblers (Bagby et al., 2007; Potenza et al., 2003). Neuroticism was also found to be a predictor of pathological gambling (Myrseth et al., 2009). The internal consistency of the five BFI-10 subscales was as followed: extraversion (Cronbach's α = .65), neuroticism

(Cronbach's α = .53), openness (Cronbach's α = .61), conscientiousness (Cronbach's α = .13), and agreeableness (Cronbach's α = .26). Due to the unacceptable internal consistency (α < .50) of the conscientiousness and the agreeableness scales and since we were particularly interested in the personality traits conscientiousness and neuroticism, we only included the personality trait neuroticism for further analyses.

As described in Study 1, the KSE-G scale (Kemper et al., 2012) measures socially desirable responding. Because we screened and tested participants regarding socially undesirable domains (alcohol consumption and gambling behavior), we assessed the questionnaire to exclude participants with high scores (i.e., 1 *SD* above the mean of the validation study, N = 566; Kemper et al., 2012) on either of the two subscales. Both KSE-G subscales yielded an acceptable internal consistency (PQ+ scale: Cronbach's α = .62; NQ-scale: Cronbach's α = .61). None of the participants were excluded due to high scores on the two subscales.

The BIS-15 Scale (Spinella, 2007) measures the personality trait impulsivity (i.e., unplanned and rapid actions despite possible negative consequences). The questionnaire consists of 15 items using a 4-point scale, ranging from 1 (*never/ rarely*) to 4 (*almost always/ always*), which assesses three different aspects of impulsivity: motor impulsivity (e.g., "I do things without thinking."), non-planning (e.g., "I say things without thinking."), and attentional impulsivity (e.g., "I don't "pay attention."). We used the German version (Meule, Vögele, & Kübler, 2011), which shows high internal consistency (Cronbach's α = .81) and proved convergent validity in association with the UPPS scale (used in Study 1). In our sample of Study 2, the BIS-15 showed an acceptable internal consistency (Cronbach's α = .79).

The R-1 Scale (Beierlein et al., 2015) was used to measure participant's propensity to take risks in general. Participants read "How do you see yourself – how willing are you in

general to take risks.". The statement is rated on a 7-point scale ranging from 1 (*not at all willing to take risks*) to 7 (*very willing to take risks*). Psychometric properties are sufficient for this single item scale with a test-retest reliability of r_{tt} = .74. We assessed the risk-taking questionnaire because pathological gambling is associated with risky behavior in several domains (Martins, Tavares, da Silva Lobo, Galetti, & Gentil, 2004).

In addition, we intended to control for severity of gambling (measured by the SOGS) since participants who gamble on a frequent basis might also gamble more persistently and with more risk in the gambling task provided in the experiment. However, in our sample of Study 1, the SOGS showed an unacceptable internal consistency (Cronbach's α = .24). Therefore, the SOGS were excluded from further analyses.

We also controlled for the possible influence of gender since men gamble more frequently than women (Bundeszentrale für gesundheitliche Aufklärung, 2010) and they enjoy games of chance more than women (G. Meyer & Bachmann, 2011). We assumed that men, therefore, might display a higher preference for games of chance which might be associated with increased risk-taking (dependent variable).

Experimental Procedure

We followed the same preparations and applied the same ethical precautions (individual testing between noon and 8 p.m., pregnancy test, initial BAC measurement) as in Study 1.

Beverage administration. We followed the same beverage administration procedure as employed in Study 1.

Placebo manipulation check. We used the same items to check the effectiveness of the placebo manipulation as in Study 1.

Lottery task. Participants had to choose between 25 lotteries presented in pairs (and one practice trial). Each pair consisted of two lottery tickets A and B with two possible

outcomes and their probabilities – one lottery ticket offered a higher gain with a lower chance of winning (risky option) and the other offered a lower gain with a higher chance of winning (non-risky option). The expected value of the two lottery tickets was the same in each decision. In the presentation, the lottery pairs were varied according to a fixed random design. See Table 3 for a full list of lottery pairs. The task was designed to measure individual risk-taking in gambling situations. Previous studies used a similar variation of this lottery paradigm to measure risk-taking (Hey & Orme, 1994; Lane et al., 2004).

We adapted the task to allow for manipulation of making low chances of winning salient: In a first step, we simplified the task to ensure that intoxicated participants also understood the task correctly by providing only two possible gains and their respective probabilities of winning (previous versions provided four gains and their probabilities of winning). To ensure that our adapted version still measured risk-taking, we validated our task in a pilot study.

Validation of the lottery task. To ensure that our adapted lottery task measures risk-taking, we tested our lottery task (without salience manipulation) in a pilot study. To do this, we gave a separate group of 13 participants (seven women, six men, M_{age} = 28.23, *SD* = 5.13, age range: 22 – 39) the 25 lottery choices and measured their willingness to take risk in general by the willingness to take risk scale (R-1; Beierlein et al., 2015). We found that the number of choices on the risky option (lottery ticket with the higher gain and a lower chance of winning) was associated with general risk-taking, $r = .76$, $p = .003$. Therefore, we assumed that the number of choices on the higher gain with a lower chance of winning would be a valid indicator for risk-taking.

In a second step after the validation of our adapted task, we manipulated the low chances of winning to investigate the effect of alcohol and salience manipulation on risk-taking in the lab. To manipulate the low chances of winning in our adapted lottery task, we

used the same salience manipulation as in Study 1: In the low-chances-salient-condition, the low chances of winning the gains were explicitly indicated. In the no-salience-control-condition, the low chances of winning were also indicated but not highlighted. See Figure 4 for an example of the salience manipulation of low chances of winning on the lottery tickets. Of the 120 participants, 117 decided to take part in the lottery game; all three participants who did not agree to gamble had consumed alcohol. Participants who chose not to gamble were allowed to stay in the waiting room where we offered snacks and magazines. The remaining participants were then presented with the lottery game. Participants were told that they should make their choices carefully because after they had concluded the gambling task, it was randomly determined which lottery pair would become relevant for the participant's payoff and this particular lottery was played. There was no time limit for the presentation of the lotteries and participants were able to take their time to make the decision.

Eye-tracking. Each decision started with a fixation cross for 3,000 ms to attract participants' attention to the center of the screen followed by the simultaneous presentation of the two lotteries. While choosing between the two lottery tickets participants' eye movements were recorded. Specifically, data about eye movement were collected by a Tobii X120 eye-tracker (Tobii, n.d.) using projection patterns and optical sensors with a sampling data rate of 120 Hz. Tobii X120 eye-tracker allows for free head movement within a range of 44 cm x 22 cm x 30 cm. An infrared light source is directed toward the eye, and the reflection of the light on the cornea relative to the center of the pupil is used to measure the eye movement. We determined 100 ms as minimum fixation duration and the threshold for saccade detection was chosen at a velocity of 30°/s (Tobii Studio's default fixation filter setting). A 5-point calibration procedure was used, and thereafter, the examiner validated the results of each calibration. The examiner accepted the calibration when fixation points corresponded well with the configuration of the grid. An unsuccessful calibration was repeated up to three times.

If the calibration was not successful after three repetitions, the respective participant could participate in the lottery game, but eye movements were not recorded.

The lottery pairs were presented on a 52 cm (width) x 33 cm (height) flat-screen display monitor with a resolution of 1920 x 1200 pixels. Participants were seated centrally to the screen at a distance of approximately 70 cm to the monitor. We manually defined areas of interest (AOIs) around each slogan pertaining to the gains and the corresponding low chances of winning to investigate our hypotheses. Each AOI was a rectangle of 18.3 cm (width) and 3 cm (height) which occupied 4.64% of the display screen area. See Figure 5 for the defined AOIs. We assessed the time to first fixation and the fixation duration to the AOIs pertaining to the slogan of the gains and low chances of winning. The variable time to first fixation refers to the time from the start of the image displaying the two lotteries until the respective participant fixates on the respective AOI for the first time. The variable fixation duration refers to the average duration of single fixations within an AOI. Regarding the measurement of time to first fixation, we compared how fast participants gazed at one AOI of the slogan pertaining to the low chances of winning (the shorter time to first fixation of either of the two probabilities of winning presented on the two lottery pairs). Regarding the measurement of fixation duration, we summed up the data for the two AOIs of the slogans pertaining to the gains and in addition we summed up the data for the two AOIs of the slogans pertaining to the probabilities of winning presented on the two lottery pairs to investigate how long on average participants gazed at the gains and the low chances of winning over the 25 choices. We then computed an index of how long participants gazed at the low chances relative to how long they gazed at the gains in reference to Brandstätter and Körner (2014): D^f = sum of fixation duration on the two chances of winning minus the sum of fixation duration on the two gains. A positive value of D^f indicates more attention on the low chances of winning, whereas a negative value indicates more attention on the gains. We predicted that the

increased visual attention (longer fixation duration) on salient low chances mediates the myopic effect of alcohol on risky choices: In the low-chances-salient-condition, alcohol (vs. placebo) should lead to more visual attention on the low chances and to less attention on the gains, which should, in turn, predict reduced risk-taking in the lottery game. This mediated effect of increased attention on low chances should only emerge in the low-chances-salient-condition (alcohol-low-chances-salient-condition vs. placebo-low-chances-salient-condition) but not in the no-salience-control-condition (alcohol-no-salience-control-condition vs. placebo-no-salience-control-condition). Following the eye-tracking measure, participants indicated whether they wore glasses or contact lenses (a) in general and (b) during the experiment. They also indicated whether they suffered from any visual impairment. The questionnaire ended with demographic items assessing employment and native language.

As in Study 1, after completing the experimental procedure participants were asked for suspicion and thanked for participation. They were then fully debriefed and were requested to keep the purpose of the study confidential until the data collection was completed. In the case of intoxication they were obliged to remain in the laboratory until their BAC dropped below .025%. They were offered snacks and water and were encouraged to stay in the laboratory until they were completely sober. Before leaving, we reminded them not to drive for up to 6 hours after the end of the experiment. Participants were either paid the corresponding amount of money they had earned (8,50€ for each hour of participation) or received course credit for their participation. Additionally, all participants received the amount they had won in the lottery task.

Results

Preliminary Analyses

We conducted a series of one-way analyses of variances (ANOVAs) to confirm equal distribution of demographic and further variables across the four experimental groups.

Participants in the four conditions did not differ on the following variables: age, $F(3, 113) = 1.16$, $p = .327$, drinking habits (measured by the PDQH), $F(3, 113) = 1.85$, $p = .143$, severity of gambling[1] (measured by the SOGS), $F(3, 111) = 0.73$, $p = .536$, and scores in general risk-taking[1] (measured by the R-1 scale), $F(3, 112) = 0.88$, $p = .456$. Chi-square analysis revealed no significant difference in the distribution of gender between the four conditions, $\chi^2(3) = 0.97$, $p = .809$.

Blood Alcohol Content

All participants in the study had a BAC of .00% before the onset of the experiment. Participants in the alcohol-condition reached an average BAC of .052% ($SD = .012$). There was no difference between the alcohol-low-chances-salient-condition and the alcohol-no-salience-control-condition in participants' BAC, $t(56) = 1.34$, $p = .186$.

Placebo Manipulation Check

As in Study 1, one participant in the placebo-condition reported not having consumed any alcohol during the experiment and was therefore excluded from subsequent analyses. Participants who received alcohol felt more intoxicated ($M = 6.75$, $SD = 1.54$) compared to participants who received a placebo ($M = 3.33$, $SD = 1.75$), $t(113) = 11.14$, $p < .001$, Cohen's $d = 2.08$. In addition, participants who received alcohol experienced more pharmacological effects ($M = 7.28$, $SD = 1.69$) compared to participants who received a placebo ($M = 3.72$, $SD = 2.32$), $t(113) = 9.42$, $p < .001$, Cohen's $d = 1.75$; they also estimated a higher amount of alcohol consumed equivalent in bottles of beer ($M = 3.36$, $SD = 1.54$) compared to participants who received a placebo ($M = 2.19$, $SD = 1.61$), $t(113) = 3.99$, $p < .001$, Cohen's $d = 0.74$.

Risk-Taking

Due to technical problems we could not record the data of the lottery task for three participants (one received alcohol and two a placebo). The total number of choices of the

risky lottery ticket across conditions ranged from 0 to 25 with an average of 12.79 (*SD* = 6.80). As is Study 1, to test whether, when low chances were made salient, intoxicated participants (alcohol-low-chances-salient-condition) would play with less risk (i.e., fewer choices of the risky lottery ticket) than each of the other three groups (placebo-low-chances-salient-condition, alcohol-no-salience-control-condition, placebo-no-salience-control-condition), we conducted three a priori between-subject planned comparisons (non-orthogonal) with number of choices of the risky lottery ticket as dependent variable. We predicted that (a) when low chances were made salient, intoxicated participants would choose the risky lottery ticket less often than sober participants (alcohol-low-chances-salient-condition vs. placebo-low-chances-salient-condition), (b) intoxicated participants would choose the risky lottery ticket less often when low chances were made salient but not when they were *not* salient (alcohol-low-chances-salient-condition vs. alcohol-no-salience-control-condition), and (c) when low chances were made salient but not when they were *not* salient, intoxicated participants would choose the risky lottery ticket less often than sober participants (alcohol-low-chances-salient-condition vs. placebo-no-salience-control-condition).

As predicted, a significant effect of condition on risky gambling choices was found for the first comparison which contrasted the alcohol-low-chances-salient-condition with the placebo-low-chances-salient-condition: Participants in the alcohol-low-chances-salient-condition chose the risky lottery ticket less often (M = 9.11, SD = 5.94) compared to participants in the placebo-low-chances-salient-condition (M = 13.86, SD = 6.77), indicating that when low chances were made salient, intoxicated participants gambled with less risk compared to sober participants, $t(109) = 2.78$, $p = .006$, Cohen's $d = 0.75$. This finding suggests that by highlighting low chances, intoxicated participants focused more on the low chances of winning and less on the gains through alcohol-induced myopia and this led participants to gamble with less risk. On the contrary, sober participants were able to perceive

and process all given information and their risk-taking was not affected by salient low chances.

The second comparison contrasted the alcohol-low-chances-salient-condition with the alcohol-no-salience-control-condition. Again we found a significant effect: Participants in the alcohol-low-chances-salient-condition chose the risky lottery ticket less often (M = 9.11, SD = 5.94) compared to participants in the alcohol-no-salience-control-condition (M = 12.55, SD = 6.32), indicating that intoxicated participants gambled with less risk when low chances were made salient but not when they were *not* salient, $t(109) = 2.02$, $p = .046$, Cohen's $d = 0.56$. This finding suggests that alcohol only reduced risk-taking when low chances were made salient but not under normal gambling conditions (i.e., gain is highlighted, and low chances are not salient), indicating that when no salience manipulation was applied, intoxicated participants were still able to process all given information regarding the gain and the low chances of winning.

Finally, the alcohol-low-chances-salient-condition was contrasted with the placebo-no-salience-control-condition. Again we found a significant effect: Participants in the alcohol-low-chances-salient-condition chose the risky lottery ticket less often (M = 9.11, SD = 5.94) compared to participants in the placebo-no-salience-control-condition (M = 15.70, SD = 6.75), indicating when low chances were made salient but not when they were *not* salient, intoxicated participants gambled with less risk compared to sober participants, $t(109) = 3.79$, $p < .001$, Cohen's $d = 1.04$, (Figure 6). This finding suggests that making the low chances salient seemed to be effective for intoxicated participants in reducing risk-taking in comparison to normal conditions in which gamblers – either intoxicated or sober – are usually faced with. Meaning lotteries on which the gain is highlighted, and the low chances of winning are not made salient. See Table 4 for means and standard deviations for the dependent variable.

Eye-Tracking: Salience Manipulation Check (Time to First Fixation)

Eye movements of six participants were not recorded due to poor calibration results. Choices of two participants were excluded because their average time to first fixation on the low chances of winning was greater than three interquartile range of the mean. On average, it took participants 1150.21 ms (*SD* = 578.16) to fixate on the chances of winning the first time. As predicted, participants in the low-chances-salient-condition fixated more quickly on the low chances of winning (*M* = 1036.07, *SD* = 610.42) than participants in the no-salience-control-condition (*M* = 1264.36, *SD* = 525.26), $t(102) = 2.04$, $p = .043$, Cohen's $d = 0.40$. Therefore, we assumed our salience manipulation as successfully employed.

Eye-Tracking: Alcohol-Myopic Effect on Risk-Taking Mediated by Attention on Low Chances of Winning vs. Gains (Fixation Duration)

The index of attention on chances of winning relative to the gains, D^f = sum of fixation duration on the two chances of winning minus the sum of fixation duration on the two gains, was significantly higher in the alcohol-condition (*M* = 36.39, *SD* = 141.69) than in the placebo-condition (*M* = -35.54, *SD* = 84.03) when low chances of winning were salient, indicating that intoxicated participants focused longer on the low chances of winning relative to the gains than sober participants, $t(53) = 2.30$, $p = .025$, Cohen's $d = 0.62$. No difference in the index of attention on chances of winning relative to the gains emerged between the alcohol-condition (*M* = 31.23, *SD* = 110.43) and the placebo-condition (*M* = 24.68, *SD* = 146.50) when low chances of winning were *not* salient, $t(50) = .18$, $p = .856$. See Table 5 for means and standard deviations of fixation duration on the slogans pertaining to the gains and chances of winning and the respective D^f –score for each condition.

To test whether the myopic effect of alcohol on risk-taking was mediated by the attention on low chances of winning relative to the gains in the low-chances-salient-condition but not in the no-salience-control-condition, we conducted a mediation analysis using the

macro PROCESS (model 4; Hayes, 2013) with 10,000 biased bootstrap samples. Beverage administration (0 = placebo; 1 = alcohol) was entered as a predictor, index of attention on low chances relative to gains as mediator and number of choices of the risky lottery ticket as the dependent variable. We hypothesized that in the low-chances-salient-condition, intoxicated (vs. sober) participants should focus longer on the salient low chances of winning and shorter on the non-salient gains, which should, in turn, predict less risk-taking in the gambling task. This mediated effect should only hold true in the low-chances-salient-conditions (alcohol-low-chances-salient-condition vs. placebo-low-chances-salient-condition) since participants in the no-salience-control-condition (alcohol-no-salience-control-condition vs. placebo-no-salience-control-condition) should be able to process all given information and should not be constrained by the alcohol-induced myopic effect.

As predicted, a significant indirect effect of beverage administration on risk-taking through attention on chances of winning relative to the gains was found in the low-chances-salient-condition, b = -1.26, 95% Cl [-3.22, -0.01], κ^2 = .10 (i.e., medium effect size), indicating that alcohol led to increased attention on salient low chances and to less attention on the non-salient gains, which in turn predicted decreased risk-taking (Figure 7a). No significant indirect effect was found for the no-salience-control-condition, b = -0.09, 95% Cl [-1.28, 0.89], (Figure 7b).

Confounding Variables

Adding the potentially confounding variables as covariates (BFI-10 – personality trait neuroticism, R-1 Scale, BIS-15, PDHQ, and gender) in the ANOVA did not change the pattern of findings. The results of the three planned comparisons which contrasted the alcohol-low-chances-salient-condition with each of the other conditions (placebo-low-chances-salient-condition, alcohol-no-salience-control-condition, placebo-no-salience-control-condition) remained significant: A significant effect of condition on risky gambling

choices was found for the first comparison which contrasted the alcohol-low-chances-salient-condition with the placebo-low-chances-salient-condition, $p = .003$, 95% Cl [1.70, 8.31], for the second comparison which contrasted the alcohol-low-chances-salient-condition with the alcohol-no-salience-control-condition, $p = .022$, 95% CI [0.59, 7.34], and for the third comparison which contrasted the alcohol-low-chances-salient-condition with the placebo-no-salience-control-condition, $p < .001$, 95% CI [3.66, 10.36].

In addition, adding the potentially confounding variables as covariates in the mediation analysis did not change the pattern of findings: A significant indirect effect of beverage administration on risk-taking through attention on chances of winning relative to the gains was found in the low-chances-salient-condition, $b = -1.23$, 95% Cl [-3.46, -0.01], indicating that alcohol led to increased attention on salient low chances and to less attention on the non-salient gains, which in turn predicted decreased risk-taking. No significant indirect effect was found for the no-salience-control-condition, $b = -0.12$, 95% Cl [-0.57, 1.43].

Thus, our effect of salient low chances on gambling behavior mediated by increased attention on the low chances and decreased attention on the gains in intoxicated participants remained significant when controlling for individual differences in personality (i.e., personality trait neuroticism, impulsivity, general risk-taking), gender, and drinking habits.

Discussion

We replicated the results of Study 1 in the domain of risk-taking: Making low chances salient led intoxicated participants to gamble with less risk than sober participants. Intoxicated participants also gambled with less risk when the low chances were salient compared to the no-salience-control-conditions where the low chances of winning were *not* salient (alcohol-no-salience-control-condition, placebo-no-salience-control-condition). Moreover, our effect of salient low chances on gambling behavior in intoxicated participants remained significant when controlling for individual differences in personality (i.e.,

personality trait neuroticism, impulsivity, general risk-taking), gender, and drinking habits. In addition, we showed that the effect of alcohol and salient low chances on gambling behavior can be generalized to various gains and to many chances of winning as provided on the lottery tickets in Study 2 and not only to one particular gain and the pertaining chance of winning as provided on the slot machine in Study 1. Therefore, we extended our findings (a) to another sample (people without or with only little gambling experiences), (b) to another characteristic of gambling (i.e., risk taking), (c) to another gambling task (lottery task), and (d) to different chances of winning and gains. In summary, Studies 1 and 2 suggest that making low chances salient on games of chance could be an effective tool (medium effect size) to reduce not only gambling persistence but also risk-taking in intoxicated participants.

By using an eye-tracker in Study 2, we investigated attentional processes while drinking and gambling more closely: First, adding to the results of the preliminary study, we showed that our manipulation of salient low chances indeed attracted participants' attention and participants gazed more quickly at the highlighted low chances than participants in the no-salience-control-condition. Second, we replicated the findings of Moser et al. (1998) that inducing alcohol (vs. placebo) led to increased attention on salient cues. Also in line with the research of Moser et al. (1998), we did not observe a difference between intoxicated and sober participants when no salient cues were provided. Third, we showed that highlighting low chances led to increased attention on salient low chances of intoxicated participants which in turn predicted less risk-taking in the gambling task by applying a mediation analysis. The effect of salient low chances on gambling behavior mediated by increased attention on the low chances and decreased attention on the gains in intoxicated participants also remained significant when controlling for individual differences in personality (i.e., personality trait neuroticism, impulsivity, general risk-taking), gender, and drinking habits. Therefore, we extended the inconsistent findings of previous research on the effect of alcohol

myopia on attentional processes (Gallagher & Parrott, 2011; Sher et al., 2007) by showing that the attentional shift to the low chances of winning and away from the gains accounted for the effect of alcohol on risk-taking in intoxicated participants when the low chances of winning were salient. Previous studies on alcohol myopia theory only showed that alcohol either increased or decreased a particular behavior directly (i.e., aggression, intention to drink and drive, anxiety) depending on which cues were salient and thus provided only indirect evidence that the attentional shift on salient cues may have accounted for the association between alcohol and the respective behavior. Therefore, the present study advances the understanding of the precise attentional processes proposed by alcohol myopia theory and sheds more light on the precise mechanisms of the effect of alcohol on risky behavior. The findings support the primary hypothesis of the alcohol myopia theory, stating that intoxicated people's behavior is disproportionally influenced by salient cues by allocating the attention on the salient cue. Therefore, by making an inhibiting cue salient, the attention of intoxicated participants is drawn to the salient inhibiting cue and away from the impelling cue and as a result, the respective behavior (i.e., gambling) is reduced.

Study 1 and 2 were both conducted in the laboratory. When people consume alcohol and gamble in a lab, they are removed from a situation in which they typically engage in this behavior. Therefore, we conducted Study 3 in the field to enhance the external validity. To set up a situation that resembles a naturalistic gambling situation, we once more raised the amount of the jackpot displayed (5000€) and lowered the chances of hitting the jackpot (1/5000).

Study 3: Alcohol Myopia and Gambling Persistence in the Field

Study 3 aimed to replicate our findings in the laboratory, that making low chances salient led intoxicated participants to gamble less persistently, in a natural setting. Although laboratory studies allow a higher control of confounding variables than field studies, it is

important to investigate whether the pattern of results found in Study 1 and 2 holds true for a real-life gambling situation (higher external validity). Conducting a field study, therefore, offered several advantages compared to the laboratory studies: First, we could reduce socially desirable responding and demand effects since participants were not aware of being enrolled in a study on the effect of alcohol intake and the awareness of being observed was lowered. Second, we could rule out the alternative explanation for our findings of Study 1 and 2 that participants only gambled because they had to stay in the laboratory until their BAC reached .025%. In the field study, participants were invited to play on our manipulated slot machine as a gift for participating in the study "leisure activities and personality" which we used as our cover story. The gambling on the slot machine was optional, and otherwise, if they decided not to gamble, the experimenter carried on with the questionnaire. Third, the study took place in an environment where alcohol intake and gambling are more natural – in a local bar in Hamburg. In Study 3, we assessed the BAC of bar patrons and measured their gambling persistence on our manipulated slot machine from Study 1. We hypothesized that when low chances of winning are salient, the higher the measured BAC of the bar patrons, the fewer trials they should play. Furthermore, intoxicated participants in the low-chances-salient-condition should play less persistently compared to intoxicated participants in the no-salience-control-condition.

Method

Participant Recruitment and Design

We recruited 121 participants (54 women, 67 men, M_{age} = 30.08, *SD* = 7.35, age range: 18 – 57 years) by asking bar patrons of a local bar if they were willing to take part in a study on "leisure activities and personality" in which they would fill out a questionnaire, their BAC would be assessed, and as a gift they would receive 5€ which they could either keep or could gamble with on a computerized slot machine and keep the gains. Of the 121

participants, 119 decided to gamble. Regarding experience in gambling, 75.4% indicated that they had gambled at least once in their lives. Bar patrons were randomly assigned to the two conditions (low-chances-salient-condition vs. no-salience-control-condition).

Procedure

The experiment took place in a local bar in Hamburg, Germany. Data were collected between 8:00 p.m. and 1:30 a.m. We approached patrons of the bar and asked whether they were interested in participating in a study on "leisure activities and personality" in which they would fill out a questionnaire, their BAC would be measured to control for the influence of alcohol on their responses, and as a gift they would receive 5€ which they could keep or could gamble with on a slot machine and keep the gains. If they agreed, they signed an informed consent, and we assessed their BAC after they had rinsed their mouths with water to prevent an overestimation of their actual BAC due to any remaining alcohol in their mouths. Then they filled out the first part which consisted of the following screening questionnaires and measurements of individual differences in personality as potentially confounding variables: the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), Lübeck Alcohol Dependency and Abuse Screening Test (LAST; Rumpf, Hapke, Hill, & John, 1997), the NEO-Five-Factor-Inventory in the 30-Item-Short-Version (NEO-FFI-30; Körner et al., 2008), the Behavioral Inhibition/Behavioral Activation Scales (BIS/BAS; Carver & White, 1994). Participants with a SOGS-Score higher or equal to 5 or with a LAST-Score higher or equal to 2 were excluded. Subsequently, they were offered the 5€ with which they could gamble on the slot machine.

Screening questionnaires. As in Studies 1 and 2, participants were screened for problematic or pathological gambling using the SOGS (Lesieur & Blume, 1987). To screen for alcohol abuse or dependence, instead of the Brief Michigan Alcoholism Screening Test

(B-MAST; Pokorny et al., 1972) as in Studies 1 and 2, we used the shorter Lübeck Alcohol Dependency and Abuse Screening Test (LAST; Rumpf et al., 1997) in Study 3.

The LAST (Rumpf et al., 1997) was used to detect participants with alcohol abuse or dependence. This self-report questionnaire consists of seven items. The items were adapted from two previously frequently used questionnaires in this domain – two items were adopted from the CAGE (Ewing, 1984) and five items of the Michigan Alcoholism Screening (MAST; Selzer, 1971). Compared to the CAGE and MAST, the LAST questionnaire shows considerable advantages regarding sensitivity and economy. A score of 2 or higher points to alcohol abuse or dependence. In the current study, participants with a score of 2 or higher were excluded.

Confounding variables. As in Study 1, we administered the BIS/BAS Scale (Carver & White, 1994) to measure people's sensitivity to reward through the behavioral approach system (BAS) and their sensitivity to punishment through the behavioral inhibition system (BIS). Since previous research found that pathological gamblers demonstrated higher BIS and BAS scores compared to a healthy control group (Rahman et al., 2014), we intended to control for these differences. In our sample of Study 3, both scales showed a high internal consistency (BIS scale: Cronbach's $\alpha = .83$; BAS scale: Cronbach's $\alpha = .88$).

In addition, to investigate the role of personality more deeply, we used the NE0-FFI-30 instead of the BFI-10 as in Studies 1 and 2 since the former questionnaire shows better psychometric properties. We controlled for the Big Five personality traits because previous research found lower scores on conscientiousness (Bagby et al., 2007) and higher scores on neuroticism in pathological gamblers compared to non-pathological gamblers (Bagby et al., 2007; Potenza et al., 2003). Neuroticism was also found to be a predictor of pathological gambling (Myrseth et al., 2009).

The NEO-FFI-30 (Körner et al., 2008) assesses the Big Five personality traits using 30 items. Each of the five dimensions (extraversion, agreeableness, conscientiousness, neuroticism, and openness) is measured by six questions. Participants answer on a 5-point scale ranging from 0 (*strong disagreement*) to 4 (*strong agreement*) how strongly they agree with the given statements. The psychometric properties are acceptable, and the NEO-FFI-30 shows a high correlation with the original NEO-FFI consisting of 60 items (Borkenau & Ostendorf, 1993). In our sample of Study 3, the internal consistency of the five subscales was as followed: extraversion (Cronbach's $\alpha = .89$), neuroticism (Cronbach's $\alpha = .88$), openness (Cronbach's $\alpha = .80$), conscientiousness (Cronbach's $\alpha = .79$), and agreeableness (Cronbach's $\alpha = .77$).

In addition, we controlled for severity of gambling (measured by the SOGS) since participants who gamble on a frequent basis might also gamble more persistently in the gambling task provided in the experiment. In our sample of Study 3, the SOGS showed an excellent internal consistency (Cronbach's $\alpha = .90$).

We also controlled for the possible influence of gender since men gamble more frequently than women (Bundeszentrale für gesundheitliche Aufklärung, 2010) and they enjoy games of chance more than women (G. Meyer & Bachmann, 2011). We assumed that men, therefore, might display a higher preference for games of chance which might be associated with increased gambling persistence (dependent variable).

Slot machine game. We used the same manipulated slot machine as in Study 1 except for the following modifications: First, we shortened the length of the game for one winning sequence due to the field setting. Accordingly, patrons could play a maximum of 66 games with their 5€; wins occurred at trials 3, 8, 15, 20, 28, 35, 40, and 50. Second, we raised the amount of the jackpot to 5000€ and lowered the chances of winning to 1/5000 since in real gambling situations (e.g., casinos) the jackpot is often higher than the one we used in

Study 1 (see, for example, Casino Baden, n.d.). See Figure 8 for the salience manipulation of low chances of winning.

Low subjective chances of winning. The attractiveness of winning the jackpot and the height of the estimated chances of winning were assessed like in Study 1. However, due to the field setting we used a shorter 5-point scale ranging from 1 (*very unattractive* and *very low*, respectively) to 5 (*very attractive* and *very high*, respectively). Because in Study 1 the salience manipulation did not systematically affect the estimated chances and as a result of time constraints due to the field setting, in Study 3, we only assessed these variables before participants gambled.

Then, participants filled out the second part of the questionnaire which contained demographic questionnaires assessing gender, age, employment, and native language. Finally, they were thanked, fully debriefed and were requested to keep the purpose of the study confidential until the data collection was completed.

Results

Preliminary Analyses

We conducted several *t*-tests for independent samples to check for equal distribution of demographic and further variables across the two salience groups. Participants in the two salience conditions did not differ on the following variables: age[1], $t(113) = -0.45$, $p = .652$, drinking habits[1] (measured by the LAST), $t(109) = -1.79$, $p = .076$, severity of gambling[1] (measured by the SOGS), $t(108) = 0.41$, $p = .682$. Chi-square analysis revealed no significant difference in the distribution of gender between the two conditions, $\chi^2(1) = 0.58$, $p = .447$.

Blood Alcohol Content

Participants' BAC ranged from .00 to .18% with a mean BAC of .055% ($SD = .046$). There was no difference in the BAC measured between the low-chances-salient-condition and the no-salience-control-condition, $t(107.34) = -0.94$, $p = .350$.

Low Subjective Chances of Winning

As in Study 1, subjectively estimated height of chances of participants was below the midpoint of the scale (M = 1.76, SD = 0.73) and the attractiveness of the jackpot indicated by the participants was above the midpoint (M = 3.69, SD = 0.56). The subjective height of chances as well as the attractiveness of the jackpot did not differ between the two conditions, ts ≤ -1.21, ps ≥ .228.

Persistence in Gambling

Two participants were excluded from the analyses because they reported difficulties in understanding the slot machine.

Number of trials played. Across conditions, participants played on average 32.25 (SD = 17.61) trials. To test whether our salience manipulation influences the effect of alcohol on gambling persistence, we conducted a moderation analysis using the macro PROCESS (model 1; Hayes, 2013) with 10,000 biased bootstrap samples since we assessed acute alcohol consumption as a continuous variable. Since the assumption of homogeneity of variance was found to be violated through Levene Test, p = .023, we used a heteroscedasticity-consistent standard error estimator. BAC as a continuous variable was entered as a predictor, salience manipulation (0 = low-chances-salient; 1 = no-salience-control) as moderator and number of trials played as the dependent variable. We found a significant interaction effect, b = 177.11, 95% Cl [31.63, 322.59], t = 2.41, p = .018, indicating that the relationship between BAC and gambling persistence changed in the two salience groups (see Figure 9a and Table 6a for the full model). To examine the relationship between the BAC and gambling persistence for each salience group, we conducted further simple slopes analyses (Aiken & West, 1991). As predicted, simple slope analysis revealed that when the low chances were made salient, the higher participants' BAC, the fewer trials they played, b = -126.78, 95% Cl [-242.51, -11.05], t = -2.17, p = .032. However, when low

chances were not salient, there was no relation between BAC and the number of trials played, b = 50.33, 95% Cl [-37.83, 138.49], t = 1.13, p = .261.

Moreover, also as predicted, among participants with a high BAC (i.e., .10%, 1 *SD* above the mean, Aiken & West, 1991) salient low chances affected gambling persistence and they played fewer trials when low chances were made salient compared to when they were *not* made salient, b = 20.17, 95% Cl [12.11, 28.24], t = 4.96, p < .001. However, among participants with a low BAC (i.e., .01%, 1 *SD* below the mean) salient low chances had no effect on gambling persistence and there was no difference between the two salience conditions, b = 3.75, 95% Cl [-6.09, 13.59], t = .76, p = .451. Using the Johnson-Neyman Technique (Johnson & Neyman, 1936), which calculates regions of statistical significance for the moderated effect of alcohol and salience manipulation on gambling behavior, revealed that starting from a BAC of .031% salient low chances had an effect on gambling persistence.

Money Lost. Across conditions, participants lost 2.26€ (*SD* = 1.36). Since the assumption of homogeneity of variance was found to be violated through Levene Test, p = .010, we used a heteroscedasticity-consistent standard error estimator. As in Study 1, money lost was a function of number of trials played and the variables were highly correlated (r = .99, p < .001). Therefore, the pattern for the amount of money lost mirrored the pattern for the number of trials played: We found a significant interaction effect, b = 13.70, 95% Cl [2.54, 24.87], t = 2.43, p = .017, indicating that the relationship between BAC and gambling persistence changed in the two salience groups (see Figure 9b and Table 6b for the full model). To examine the relationship between the BAC and the gambling persistence for each salience condition, we conducted further simple slopes analyses (Aiken & West, 1991). As predicted, simple slope analysis revealed that when the low chances were made salient, the higher participants' BAC, the less money they lost, b = -9.97, 95% Cl [-18.71, -1.22],

t = -2.26, p = .026. However, when low chances were *not* salient, there was no relation between BAC and money lost, b = 3.73, 95% Cl [-3.21, 10.67], t = 1.07, p = .289.

Also as predicted, among participants with a high BAC, salient low chances affected gambling persistence and they lost less money when low chances were made salient compared to when they were *not* made salient, b = 1.54, 95% Cl [0.93, 2.16], t = 4.98, p < .001. However, among participants with a low BAC, salient low chances had no effect on gambling persistence and there was no difference between the two salience conditions, b = 0.27, 95% Cl [-0.49, 1.03], t = 0.71, p = .481. Using the Johnson-Neyman Technique revealed that starting from a BAC of .032% salient low chances had an effect on gambling persistence.

Confounding Variables

Adding the potentially confounding variables as covariates (BIS/BAS Scale, NEO-FFI-30, SOGS, and gender) in the moderation analysis did not change the pattern of findings[3]: The interaction effect between the assessed BAC and salience manipulation on gambling persistence remained significant, b = 289.19, 95% Cl [116.90, 461.48], t = 3.33, p = .001. In addition, the pattern of the simple slope analysis for the low-chances-salient-condition remained the same: The higher participants' BAC, the fewer trials they played, b = -199.61, 95% Cl [-338.38, -60.84], t = -2.86, p = .005. Among participants with a high BAC, salient low chances affected gambling persistence, and they played fewer trials when low chances were made salient compared to when they were *not* made salient, b = 27.96, 95% Cl [17.82, 38.09], t = 5.48, p < .001. Among participants with a low BAC, salient low chances had no effect on gambling persistence, and there was no difference between the two salience conditions, b = 0.57, 95% Cl [-9.84, 10.98], t = 0.11, p = .914.

Discussion

In Study 3, we could replicate our findings from our laboratory Study 1 in the field: When low chances were made salient, the more alcohol participants had consumed, the fewer trials they played. This association only occurred when the low chances of winning were made salient but not in the no-salience-control-condition where the low chances of winning were *not* made salient. Moreover, when low chances were made salient (vs. not), participants with a high BAC but not those with a low BAC played fewer trials. Making low chances salient affected gambling behavior starting from a BAC of .031%, which would be equivalent to only two bottles of beer for a female of average stature. This means that the effect of salient low chances on reduced gambling persistence arises after having consumed only a small amount of alcohol. Again, our effect of salient low chances on gambling behavior in intoxicated participants remained significant when controlling for individual differences in personality (i.e., the Big Five personality traits, sensitivity to reward or punishment), gender, and severity of gambling. Therefore, the findings of Study 3 suggest that, not only under controlled conditions but also in a naturalistic setting, making low chances salient could be an effective tool for preventing escalated gambling in intoxicated gamblers.

General Discussion

We conducted three studies to investigate whether making low chances salient in a gambling situation can reduce gambling behavior under the influence of alcohol. Making low chances of winning salient by highlighting slogans about the low probability of hitting the jackpot on slot machines (Study 1) and lottery tickets (Study 2) led intoxicated participants to play less persistently and with less risk compared to sober participants and compared to participants in a no-salience-control-condition (i.e., low chances not salient). In Study 3, we extended our findings of Studies 1 and 2 by showing that the effect of salient low chances on reduced gambling persistence can also be found in a more natural setting, that is, a local bar.

In addition, we examined the mechanism of alcohol-induced myopia and salient low chances on gambling behavior more closely in Study 2 by showing that alcohol led participants to focus longer on the salient low chances and less on the gains, which in turn predicted reduced risk-taking.

We could show the effect that making low chances of winning salient leads to reduced gambling behavior under the influence of alcohol in the setting of a highly controlled laboratory as well as in the field. We could show the effect with different samples (participants recruited from the general population, occasional gamblers, and bar patrons), gambling tasks (slot machine, lottery game), chances of winning (1/1000, chances of winning between 1/100 and 45/100 in the lottery task, 1/5000) and with different gains (300€, different gains between 0.50€ and 50.00€ in the lottery task, 5000€). Furthermore, the effect held true even after controlling for individual differences, such as impulsivity, the Big Five personality traits, sensitivity to reward and punishment, gender, severity of gambling and drinking habits. Our results suggest that the consumption of only a small amount of alcohol (i.e., a blood alcohol content of .031%) was enough to affect participants' gambling behavior. Meaning consuming two bottles of beer for a female of average stature is enough to be affected by salient low chances of winning.

In summary, the findings of our three studies suggest that making low chances salient could be an effective (medium effect size) intervention to reduce gambling persistence as well as risk-taking under the influence of alcohol and that the effect of salient low chances on reduced gambling behavior arises after having consumed only a small amount of alcohol. Furthermore, as making low chances of winning salient is a very small and low-cost intervention, it could be easily applied on a large scale to reduce gambling behavior under the influence of alcohol.

Our finding, that making low chances of winning salient led intoxicated participants to gamble less persistently and with less risk compared to sober participants and compared to participants in a no-salience-control-condition, is in line with the research of Sevincer et al. (2012) which showed that making low expectations salient led intoxicated (vs. sober) participants to attach themselves less to an important goal. The second finding, that alcohol (vs. placebo) led participants to fixate longer on the salient, central cue (i.e., low chances of winning) and less on the non-salient, peripheral cue (i.e., gains) when low chances of winning were made salient, is consistent with the pattern of Moser et al. (1998) who observed that alcohol led to longer fixations on areas of high semantic interest, resulting in less time available to scan more peripheral areas compared to a sober control condition. The result that increased visual attention of intoxicated participants on salient low chances and decreased attention on the gains mediated the effect of alcohol on reduced risk-taking extends prior findings of Gallagher and Parrott (2011) who showed that intoxicated, distracted men showed less aggression and a reduced attentional bias on aggression-related cues compared to intoxicated, non-distracted participants, but failed to show that the reduced attentional bias accounted for the effect of alcohol on aggression. The findings provide further support for the research of Sher et al. (2007) who observed that impaired sustained attention in intoxicated (vs. sober) participants accounted for the effect of alcohol on reduced anxiety, but only on one of their three dependent variables (skin conductance).

One may argue that highlighting the potential jackpot, as applied in the no-salience-control-condition, should have led to more persistent and risky gambling. However, we provided the same information about the potential jackpot (i.e., valued outcome = value) and the low chances of winning (i.e., expected chances of successfully attaining the valued outcome = expectancy) in all four experimental groups. Therefore, according to expectancy x value theories of motivation (Atkinson, 1957; Locke & Latham, 1990; McClelland, 1987;

summary by Oettingen & Gollwitzer, 2001), participants decision to pursue the valued outcome by gambling should not differ as all participants received the same information. We provided the same information regarding the gain and the low chances of winning in all four groups to ensure that our effect of alcohol on gambling behavior was due to the salience manipulation and not due to the presentation of different information.

In the low-chances-salient-condition, we only manipulated the salience of the probability of winning (i.e., expectancy) and therefore, intoxicated participants focused more on the low chances of winning and less on the potential jackpot. Thus, their gambling behavior was influenced by the salient inhibiting cue (i.e., low chances of winning). In the no-salience-control-condition, the highlighted potential gain was *not* salient as shown in our preliminary study since participants rated the slogan "Win up to $300" as familiar and typical in gambling situations, and therefore the slogan did not accomplish the second factor of the two dimensions of salience. Thus, no salience manipulation was applied, and intoxicated participants were still able to attend to and process all given information regarding the gain and the low chances of winning and their attention was not drawn to a particular salient cue.

Since we were particularly interested in the reduction of gambling behavior, we did not implement a condition in which only the potential jackpot (i.e., value) was provided and the chances of winning were not indicated or a condition in which the potential jackpot was made salient which should have promoted gambling behavior according to alcohol myopia theory.

Alternative Explanation: Changes in Subjective Chances

One alternative explanation could be that making the low chances salient might have affected (i.e., lowered) intoxicated participants' subjective chances of winning differently compared to sober participants and compared to participants in the no-salience-control-conditions and in this way may have reduced their persistence in gambling. We can rule out

this possible alternative explanation for the effect of alcohol on reduced gambling behavior: By measuring subjectively estimated chances of winning before and after the gambling task in Study 1, we found that subjective chances decreased for all four groups. Since participants were losing more over time, this finding comes as no surprise. This pattern speaks against the possibility that the salience manipulation affected intoxicated participants' subjective chances of winning differently. In addition, this pattern is consistent with the results of Sevincer and Oettingen (2009, 2013) who did not find an effect of alcohol on subjective expectations of attaining a desired goal.

Implications

Research implications: Myopia as a mechanism for the effect of alcohol on gambling behavior. We could apply alcohol myopia theory, stating that alcohol either increases or decreases a certain social behavior (e.g., aggression, anxiety, intention to drink and drive) depending on whether impelling or inhibiting cues are salient, to a new domain: gambling behavior.

In addition, we examined the mechanism of alcohol-induced myopia and salient low chances of gambling behavior more closely by showing that alcohol led participants to focus longer on the salient low chances and less on the gains which in turn predicted reduced risk-taking. Previous studies, examining the assumptions of the alcohol myopia theory, provided only indirect evidence that alcohol led to increased attention on salient cues which in turn affected a certain social behavior (i.e., aggression, drinking and driving, anxiety). This project is one of the first to provide data on attentional processes which support the primary hypothesis of the alcohol myopia theory, stating that intoxicated people's behavior is disproportionally influenced by salient cues by allocating the attention on the salient cue. Therefore, the findings advance the understanding of the precise attentional processes proposed by alcohol myopia theory. They suggest that by making an inhibiting cue salient,

the attention of intoxicated participants is drawn to the salient inhibiting cue and away from the impelling cue and as a result, the respective behavior (i.e., gambling) is reduced.

Our research may help to explain the mixed findings of the effect of alcohol intoxication on gambling: Studies finding that alcohol *increases* gambling (e.g., Cronce & Corbin, 2010; Kyngdon & Dickerson, 1999; Phillips & Ogeil, 2007) might have used gambling tasks which did *not* display the chances of winning (e.g., video lottery terminals or simulated slot machines), whereas studies that find that alcohol does not affect gambling (Balodis et al., 2006; Breslin et al., 1999; Corazzini et al., 2015; Meier et al., 1996) or even *decreases* gambling (e.g., Cortes Aguilar et al., 2013; Sjöberg, 1969) might have used gambling tasks which displayed the chances of winning (e.g., lottery or betting tasks).

Further support for the assumption that alcohol myopia may play a role on the effect of alcohol on gambling behavior stems from the findings of Phillips and Ogeil (2007, 2010) who found that intoxicated participants who played a computer blackjack program paid more attention to a clearly visible decision aid (providing whether the odds were in their favor) and relied more on this aid compared to sober participants.

Future studies should further investigate under which conditions alcohol increases persistence and risk-taking in gambling. According to alcohol myopia theory, alcohol should promote gambling when impelling cues are salient. For example, by providing the gain in unfamiliar features as an external salient cue or by measuring the urge to gamble as an internal salient cue, which depicts a psychological, physiological, and emotional state, the role of alcohol myopia theory on gambling behavior could be examined in greater detail.

In addition, future studies should further investigate whether the in our project observed attentional processes (i.e., intoxicated participants' attention is drawn to the salient inhibiting cue and away from the impelling cue) also account for the effect of alcohol on

other types of social behavior, such as unprotected sexual intercourse, drinking and driving, or disinhibited eating.

Clinical implications. In 2013, people in Germany spent approximately 70 billion euros on games of chance (Bundeszentrale für gesundheitliche Aufklärung, 2014; "Deutsche haben 70 Milliarden Euro beim Glücksspiel verzockt," 2014). Prolonged and risky gambling can have negative consequences financially (e.g., loss of high amounts of money) and in health (e.g., development of an addiction). Since maladaptive behavior within even a single gambling session can set the stage for the development of problematic or pathological gambling (i.e., "chasing" for a certain amount of money lost earlier by continuing gambling; Cronce & Corbin, 2010), interventions at an early stage are required to prevent excessive gambling. Findings of the present studies provide preliminary indications for the development of interventions for the reduction of gambling behavior under the influence of alcohol.

We would like to stress that we do not intend to encourage alcohol intake by stating that alcohol should be used to reduce gambling behavior. However, since gambling frequently occurs in conjunction with alcohol intake (Markham et al., 2012), we would advise gamblers who are trying to reduce their gambling behavior by surrounding themselves with cues related to the low chances of winning after having one or two alcoholic drinks. In real-life conditions, however, depending on the specific form of gambling, the chances of winning are not indicated or transparent. One intervention, targeting the environment, would be to change the appearance of games of chance. However, since this would require a change in gambling regulations, another possible intervention could target the receptive person, the gambler. One may explore whether the application of a simple self-regulation strategy that makes the low chances of winning cognitively accessible and thereby salient (mental contrasting with implementation intentions, MCII; Oettingen & Gollwitzer, 2010) can reduce

prolonged gambling. It would be crucial to investigate the application of this simple self-regulation strategy (MCII) by future studies.

Limitations and Future Directions

Several limitations of the presented studies merit discussion. First, in the present studies we only recruited participants with no gambling experience or participants who gambled occasionally but did not display any evidence of gambling problems (exclusion of participants with a gambling disorder screened prior to participation). Therefore, to gain insights whether making low chances of winning salient could also be effective in reducing gambling behavior for addicted gamblers, studies that investigate samples of problematic or pathological gamblers are required. Preliminary support that alcohol myopia might even help to reduce problematic behavior stems from studies on self-control of smoking under high cognitive load. Westling et al. (2006) observed that the myopic effect is not only caused by alcohol – cognitive load also seems to narrow attention (i.e., attentional myopia). The authors showed that heavy smokers (i.e., minimum of 10 cigarettes per day) who were exposed to cues discouraging smoking took fewer puffs of a cigarette under high cognitive load compared to participants under low cognitive load. Therefore, when cues which discouraged smoking were salient, cognitive load enhanced control of smoking. Transferred to the domain of problematic gambling, when cues which discourage gambling (i.e., low chances of winning) are salient, even problematic gamblers should be able to reduce their gambling behavior when attention is narrowed – either through cognitive load or through alcohol consumption.

Second, we compared the effect of alcohol on gambling persistence against a placebo-condition which allowed us to examine the pharmacological effect of alcohol while ruling out expectancy effects by holding the belief of consuming alcohol constant (Martin & Sayette, 1993). A no-alcohol-control-condition, in which participants would have been informed that

they would not receive alcohol, was not incorporated. However, since the findings of Sevincer (2008) demonstrated that a placebo and no-alcohol-control-condition did not differ on how strongly participants attach themselves to an important goal, we omitted an additional no-alcohol-control-condition.

Third, to investigate the precise mechanisms of alcohol on gambling behavior, we developed two gambling tasks: In Studies 1 and 3, we used a computerized slot machine in which the win and loss sequences were rigged in order to ensure that all participants ran through the same sequence. In Study 2, we adapted a version of the lottery pair paradigm. Both tasks were simplified compared to modern electronic gambling machines and compared to previous versions of the lottery pair paradigm to ensure that every participant (particularly intoxicated participants) understood the task. This procedure limits the external (ecological) validity of the gambling tasks. However, showing that making low chances of winning salient on our computerized slot machine also reduced gambling persistence of bar patrons in the field provides preliminary support for the external validity of our findings. Nevertheless, future studies should devise tasks which resemble more modern electronic gambling machines with three reels or multi-line formats to investigate whether making low chances of winning salient depicts an effective intervention to reduce gambling under real-life conditions.

Additional studies are also needed to investigate the cognitive mechanisms of alcohol myopia theory in greater detail. We found that through the alcohol-induced myopic effect, participants gazed longer on the salient low chances relative to the non-salient gains and this led to reduced risk-taking. Further studies could build on this result and investigate this effect in greater detail. First, it would be interesting whether the salient low chances are also more cognitively accessible, measured, for example, by a word-stem completion task (e.g., McCusker & Gettings, 1997), and whether this accessibility also mediates the effect of

alcohol myopia on gambling behavior. Second, the finding that making the inhibiting cue salient leads to increased attention on the inhibiting cue and away from the impelling cue, which in turn predicts behavioral change, should be replicated in other domains, for example in the domain of smoking and disinhibited eating.

Future studies should also investigate not only the role of external cues but also of internal cues which can also affect behavior. For example, MacDonald, MacDonald, Zanna, and Fong (2000) showed that intoxicated participants who had a high level of sexual arousal (internal cue) were more willing to take part in unprotected sexual intercourse compared to intoxicated participants who had a lower level of sexual arousal. For sober participants the level of sexual arousal did not affect the intention to risky sexual behavior. Transferred to the domain of gambling, future studies could measure the urge to gamble (internal cue) and investigate whether a higher (vs. lower) urge to gamble affects gambling behavior in intoxicated participants.

Conclusion

Based on alcohol myopia theory, stating that intoxicated people's behavior is disproportionally influenced by salient cues, we predicted and found that alcohol intoxication narrowed attention which reduced gambling persistence and risk-taking when inhibiting cues (i.e., low chances of winning) were salient. Attention allocation towards the salient low chances accounted for the association between alcohol and reduced gambling behavior. This hypothesis was tested in two laboratory studies (Studies 1 and 2) and one field study (Study 3), with different gambling tasks (slot machine gambling: Studies 1 and 3; lottery choices: Study 2), with different samples (occasional gamblers: Study 1; participants recruited from the general population: Study 2; bar patrons: Study 3) and with different chances of winning (1/1000: Study 1; chances of winning between 1/100 and 45/100 in the lottery task: Study 2; 1/5000: Study 3) and gains (300€: Study 1; different gains between 0.50€ and 50.00€ in the

lottery task: Study 2; 5000€: Study 3). Findings provide preliminary indications for the development of interventions for the reduction of gambling behavior under the influence of alcohol. Assuming that making low chances of winning salient depicts an effective intervention to reduce gambling behavior, casinos might even stop advertising or providing free alcoholic drinks for gamblers since this might lead to reduced gambling behavior.

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Footnotes

[1]Degrees of freedom vary due to missing values because participants were not forced to answer each item.

[2]We administered further questionnaires in Studies 1, 2 and 3. Since these measures are not in the scope of this thesis, they are not addressed further.

[3]Since money lost was a function of number of trials played and both variables were highly correlated, we further report only the findings of number of trials played.

Tables

Table 1

Preliminary Study, Means, Standard Deviations, and 95% Confidence Intervals for the Salience Ratings

	Condition			
	Low-chances-salient		No-salience-control	
Ratings	*M* (*SD*)	95% Cl	*M* (*SD*)	95% Cl
Prominent	5.28 (1.55)	[4.90, 5.68]	5.31 (1.69)	[4.90, 5.71]
Noticeable	5.73 (1.55)	[5.36, 6.14]	5.64 (1.63)	[5.21, 6.03]
Surprised	4.63 (2.01)	[4.10, 5.15]	2.82 (1.97)	[2.31, 3.33]
Familiar	3.18 (1.80)	[2.70, 3.59]	5.00 (1.92)	[4.51, 5.49]
Typical	3.27 (1.75)	[2.81, 3.66]	5.43 (1.61)	[5.00, 5.84]
Expected	2.88 (1.78)	[2.42, 3.31]	4.71 (1.80)	[4.23, 5.15]

Note. Cl = confidence interval.

Table 2a

Study 1, Means, Standard Deviations, and 95% Confidence Intervals for the Dependent Variable Number of Trials Played

		95% Cl	
Condition	*M* (*SD*)	*LL*	*UL*
Alcohol-low-chances-salient	29.18 (13.33)	24.01	34.35
Placebo-low-chances-salient	43.41 (26.46)	33.35	53.48
Alcohol-no-salience-control	44.34 (25.64)	34.59	54.10
Placebo-no-salience-control	39.53 (25.08)	30.17	48.90

Note. Cl = confidence interval; LL = lower limit, UL = upper limit.

Table 2b

Study 1, Means, Standard Deviations, and 95% Confidence Intervals for the Dependent Variable Money Lost

		95% Cl	
Condition	*M (SD)*	*LL*	*UL*
Alcohol-low-chances-salient	1.81 (0.98)	1.43	2.18
Placebo-low-chances-salient	2.99 (1.97)	2.24	3.74
Alcohol-no-salience-control	3.04 (1.92)	2.30	3.77
Placebo-no-salience-control	2.65 (1.87)	1.96	3.35

Note. Cl = confidence interval; LL = lower limit, UL = upper limit.

Table 3

Study 2, Random Lottery Pair Paradigm. In Each Trial Two Lottery Tickets With Two Possible Gains (and the Respective Probabilities of Winning) Were Presented

	Lottery ticket	**Non-risky option**	**Lottery ticket**	**Risky option**	**Expected value**
Practice trial	A	5.00€ (20:100)	B	25.00€ (4:100)	1.00
1.	A	0.50€ (30:100)	B	5.00€ (3:100)	0.15
2.	B	1.00€ (45:100)	A	9.00€ (5:100)	0.45
3.	A	1.50€ (40:100)	B	20.00€ (3:100)	0.60
4.	B	2.00€ (20:100)	A	40.00€ (1:100)	0.40
5.	A	2.50€ (10:100)	B	25.00€ (1:100)	0.25
6.	B	3.00€ (30:100)	A	15.00€ (6:100)	0.90
7.	A	3.50€ (20:100)	B	35.00€ (2:100)	0.70
8.	B	4.00€ (25:100)	A	10.00€ (10:100)	1.00
9.	A	4.50€ (40:100)	B	20.00€ (9:100)	1.80
10.	B	6.00€ (15:100)	A	30.00€ (3:100)	0.90
11.	A	7.00€ (40:100)	B	35.00€ (8:100)	2.80
12.	B	7.50€ (40:100)	A	50.00€ (6:100)	3.00
13.	A	8.00€ (10:100)	B	20.00€ (4:100)	0.80
14.	B	8.50€ (40:100)	A	20.00€ (17:100)	3.40
15.	A	9.00€ (35:100)	B	15.00€ (21:100)	3.15
16.	B	9.50€ (30:100)	A	15.00€ (19:100)	2.85
17.	A	10.00€ (25:100)	B	50.00€ (5:100)	2.50
18.	B	2.00€ (30:100)	A	20.00€ (3:100)	0.60
19.	A	3.00€ (35:100)	B	15.00€ (7:100)	1.05
20.	B	4.00€ (45:100)	A	10.00€ (18:100)	1.80

21.	A	1.00€ (40:100)	B	8.00€ (5:100)	0.40
22.	B	5.00€ (30:100)	A	30.00€ (5:100)	1.50
23.	A	5.00€ (45:100)	B	15.00€ (15:100)	2.25
24.	B	2.00€ (20:100)	A	40.00€ (1:100)	0.40
25.	A	1.00€ (45:100)	B	45.00€ (1:100)	0.45

Note. The order of the tickets were presented according to a fixed random design (24,2,8,1,23,10,15,13,14,22,20,21,4, 25, 17,12,18,7,19,5,3,6,16,11,9).

Table 4

Study 2, Means, Standard Deviations, and 95% Confidence Intervals for the Dependent Variable Number of Risky Choices

		95% Cl	
Condition	*M* (*SD*)	*LL*	*UL*
Alcohol-low-chances-salient	9.11 (5.94)	6.80	11.41
Placebo-low-chances-salient	13.86 (6.77)	11.29	16.44
Alcohol-no-salience-control	12.55 (6.32)	10.15	14.95
Placebo-no-salience-control	15.70 (6.75)	13.04	18.37

Note. Cl = confidence interval; LL = lower limit, UL = upper limit.

Table 5

Study 2, Means, Standard Deviations, [and 95% Confidence Intervals] for the Fixation Duration on the Slogans Pertaining to Gains and Chances of Winning

	Fixation duration in ms		
	Chances of winning	Gains	D^f
Condition	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Alcohol-low-chances-salient	404.82 (156.78) [343.46, 461.86]	368.43 (144.50) [309.45, 422.58]	36.39 (141.69) [53.94, 218.53]
Placebo-low-chances-salient	331.83 (139.34) [276.01, 380.63]	367.37 (116.44) [323.43, 411.80]	-35.54 (84.03) [-65.91, -8.46]
Alcohol-no-salience-control	468.79 (132.85) [407.36, 516.60]	437.56 (75.38) [410.06, 468.42]	31.23 (110.43) [-22.61, 63.51]
Placebo-no-salience-control	480.09 (138.54) [423.57, 529.52]	455.41 (90.62) [421.96, 491.81]	24.68 (146.50) [-38.81, 73.56]

Note. D^f = sum of fixation duration on the two chances of winning minus the sum of fixation duration on the two gains.

Table 6a.

Study 3, Linear Model of Predictors of Gambling Persistence (Number of Trials Played)

	b	95% Cl	*SE B*	*t*	*p*
Constant	32.54	[24.19, 40.88]	4.21	7.73	$p < .001$
Condition (0 = low-chances-salient; 1 = no-salience-control)	2.12	[-8.83, 13.07]	5.53	.38	$p = .702$
BAC	-126.78	[-242.51, -11.05]	58.42	-2.17	$p = .032$
Condition x BAC	177.11	[31.63, 322.59]	73.43	2.41	$p = .018$

Note. Cl = confidence interval.

Table 6b.

Study 3, Linear Model of Predictors of Gambling Persistence (Money Lost)

	b	95% Cl	*SE B*	*t*	*p*
Constant	2.30	[1.66, 2.94]	0.33	7.08	$p < .001$
Condition (0 = low-chances-salient; 1 = no-salience-control)	0.15	[-0.70, 0.99]	0.43	0.34	$p = .734$
BAC	-9.97	[-18.72, -1.22]	4.42	-2.26	$p = .026$
Condition x BAC	13.70	[2.54, 24.87]	5.64	2.43	$p = .017$

Note. Cl = confidence interval.

Figures

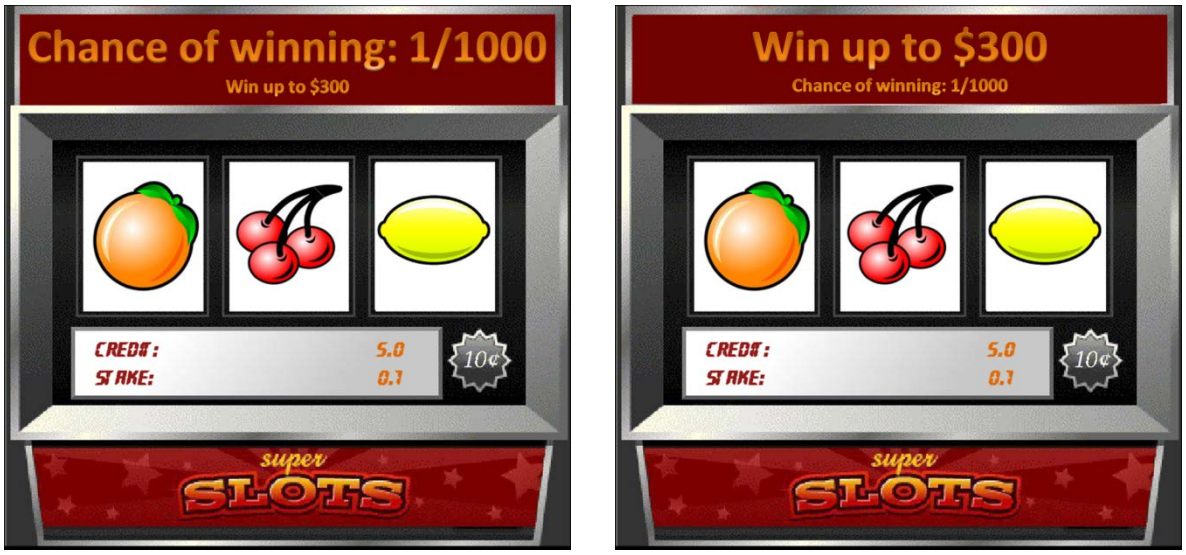


Figure 1. Simulated computerized slot machine used in the preliminary study. Low-chances-salient-condition on the left and no-salience-control-condition on the right.

Figure 2. Simulated computerized slot machine used in Study 1. Low-chances-salient-condition on the left and no-salience-control-condition on the right.

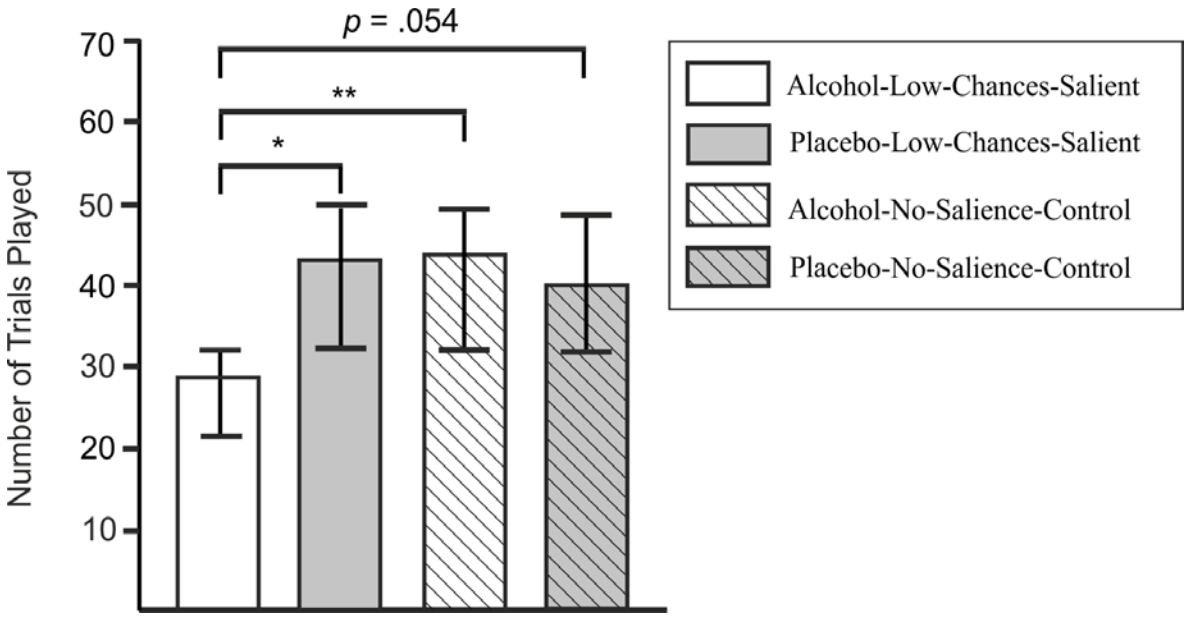


Figure 3a. Mean number of trials played in the four conditions in Study 1. Error bars indicate 95% confidence intervals.
* $p < .05$. ** $p < .01$.

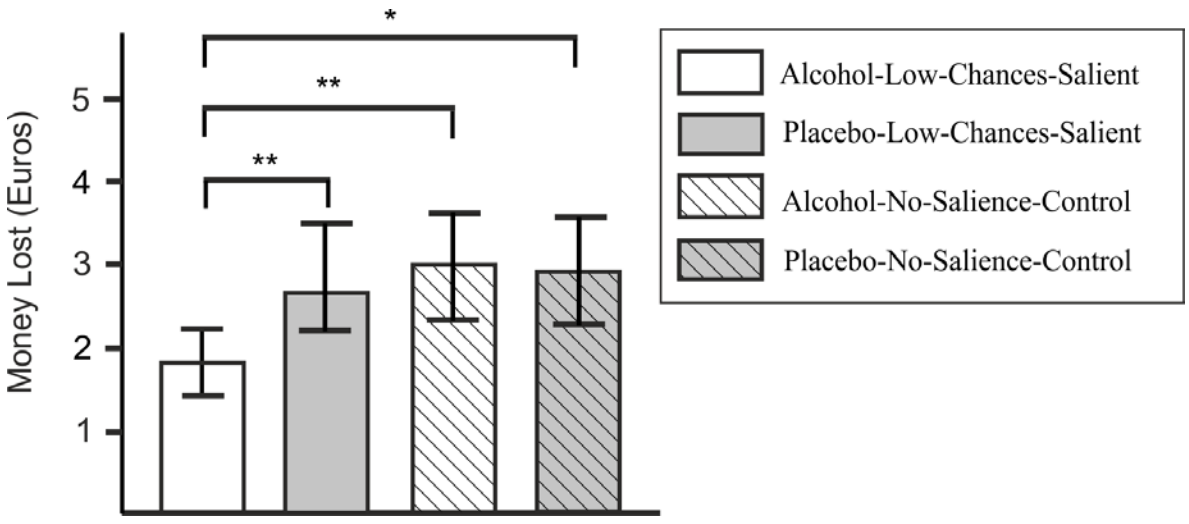
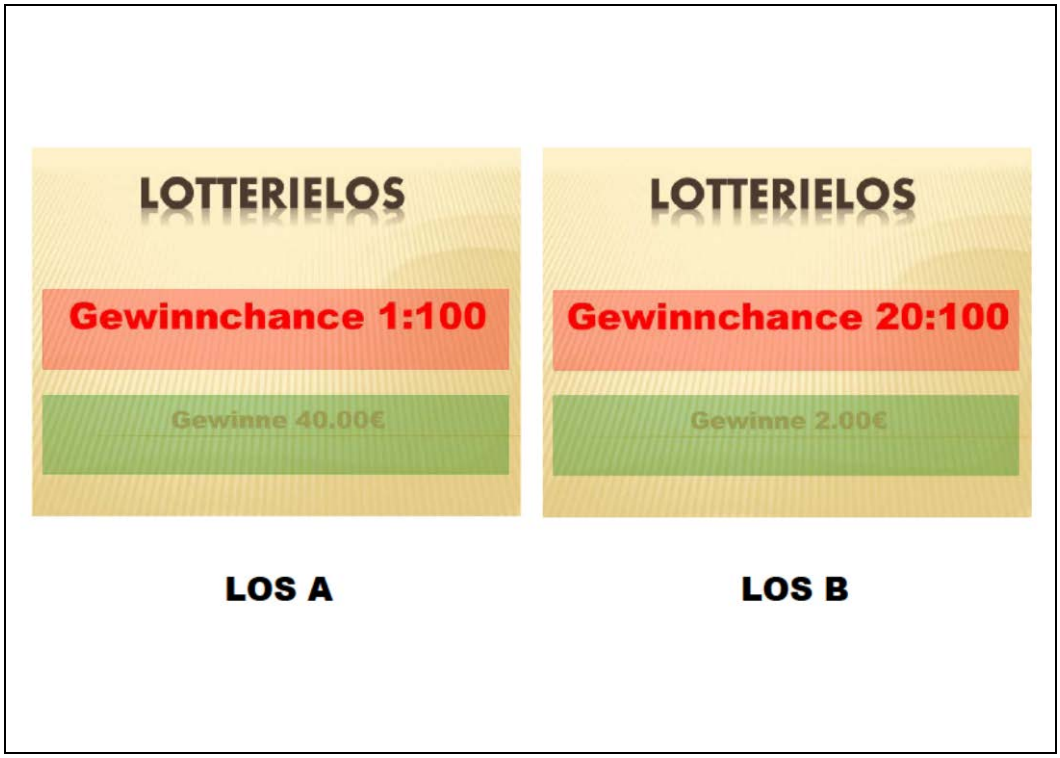


Figure 3b. Mean number of money lost (euros) in the four conditions in Study 1. Error bars indicate 95% confidence intervals.
* $p < .05$. ** $p < .01$.

Figure 4. Lottery tickets used in Study 2. Low-chances-salient-condition above and no-salience-control-condition below.



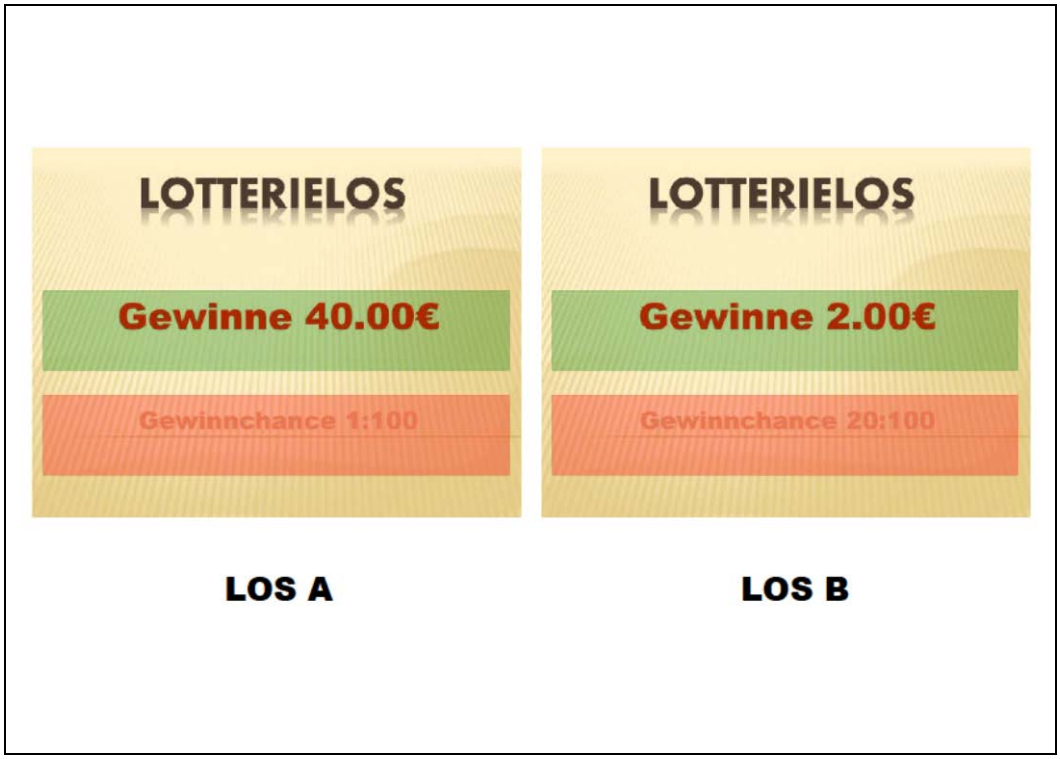


Figure 5. Manually defined areas of interest (AOIs) for the slogans pertaining to the gains and low chances of winning in Study 2. Low-chances-salient-condition above and no-salience-control-condition below.

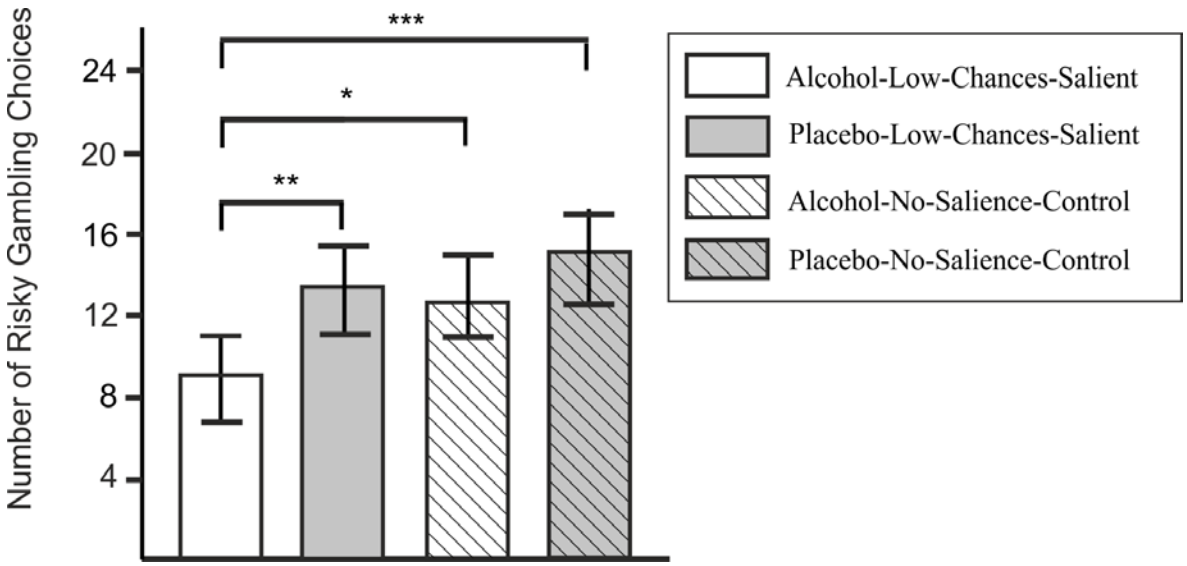


Figure 6. Mean number of choices of the risky gambling ticket in the four conditions in Study 2. Error bars indicate 95% confidence intervals.
* $p < .05$. ** $p < .01$. *** $p < .001$.

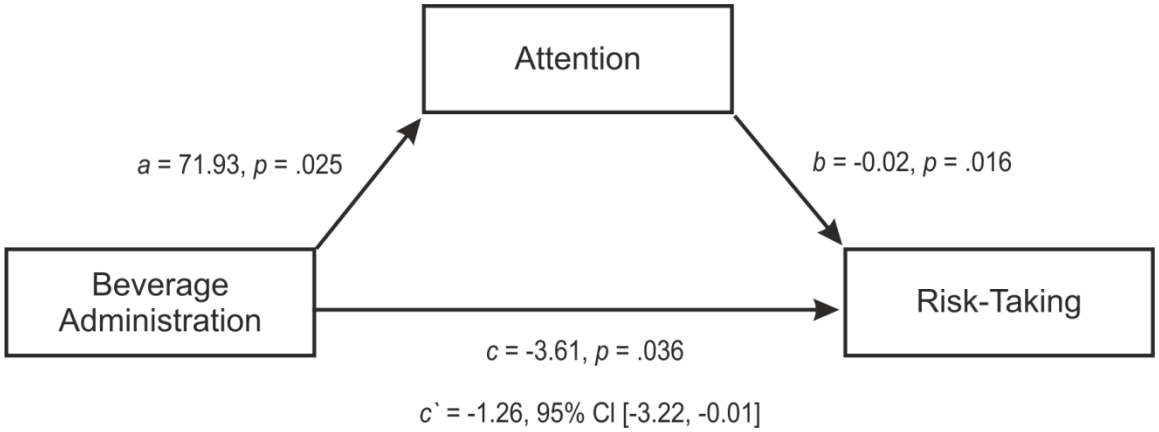


Figure 7a. Mediator model (Model 4 in the PROCESS macro; Hayes, 2013) for beverage administration (1 = alcohol; 0 = placebo) on number of risky choices via attention on low chances of winning relative to the gains in the low-chances-salient-condition in Study 2. The confidence interval (Cl) for the indirect effect is a bias-corrected bootstrapped Cl based on 10,000 samples.

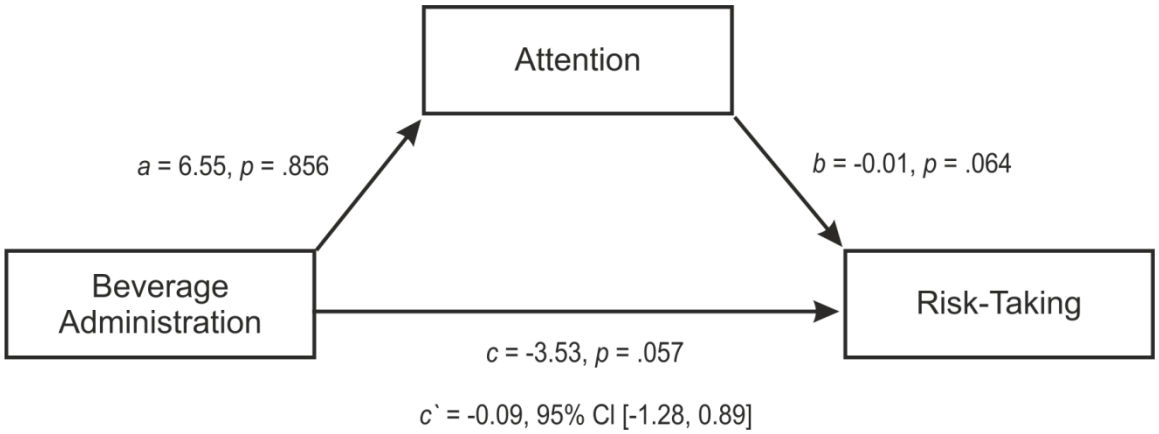


Figure 7b. Mediator model (Model 4 in the PROCESS macro; Hayes, 2013) for beverage administration (1 = alcohol; 0 = placebo) on number of risky choices via attention on low chances of winning relative to the gains in the no-salience-control-condition in Study 2. The confidence interval (Cl) for the indirect effect is a bias-corrected bootstrapped Cl based on 10,000 samples.

Figure 8. Simulated computerized slot machine used in Study 3. Low-chances-salient-condition on the left and no-salience-control-condition on the right.

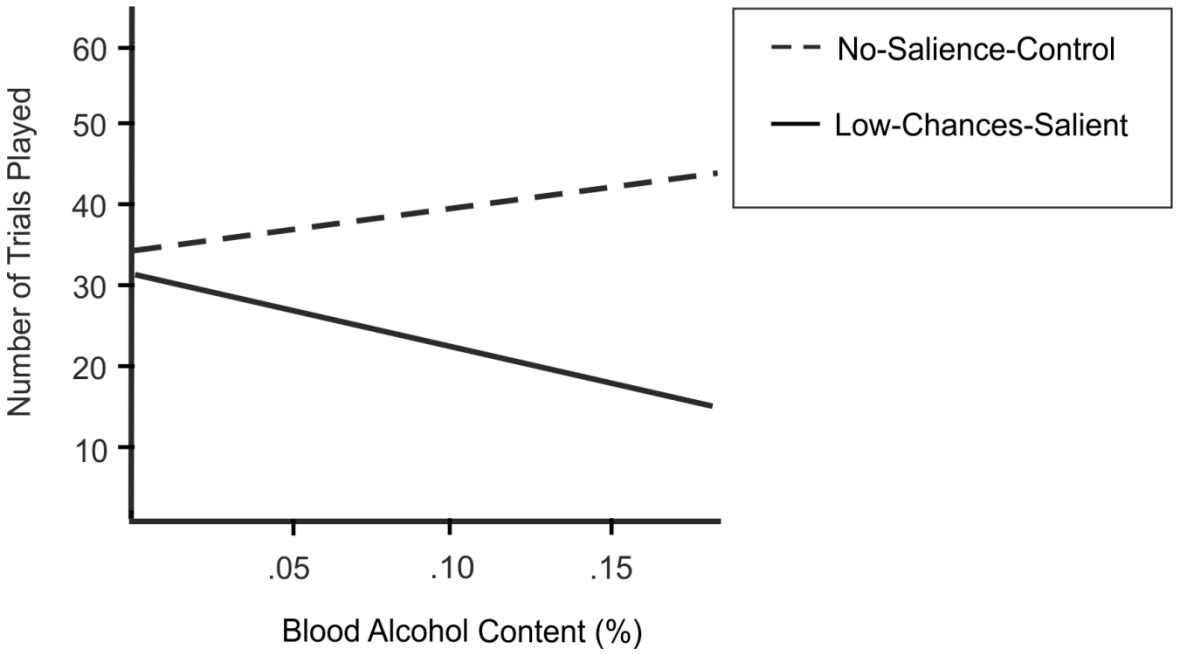


Figure 9a. Regression line showing number of trials played as a function of BAC and condition (0 = low-chances-salient, 1 = no-salience-control) in Study 3.

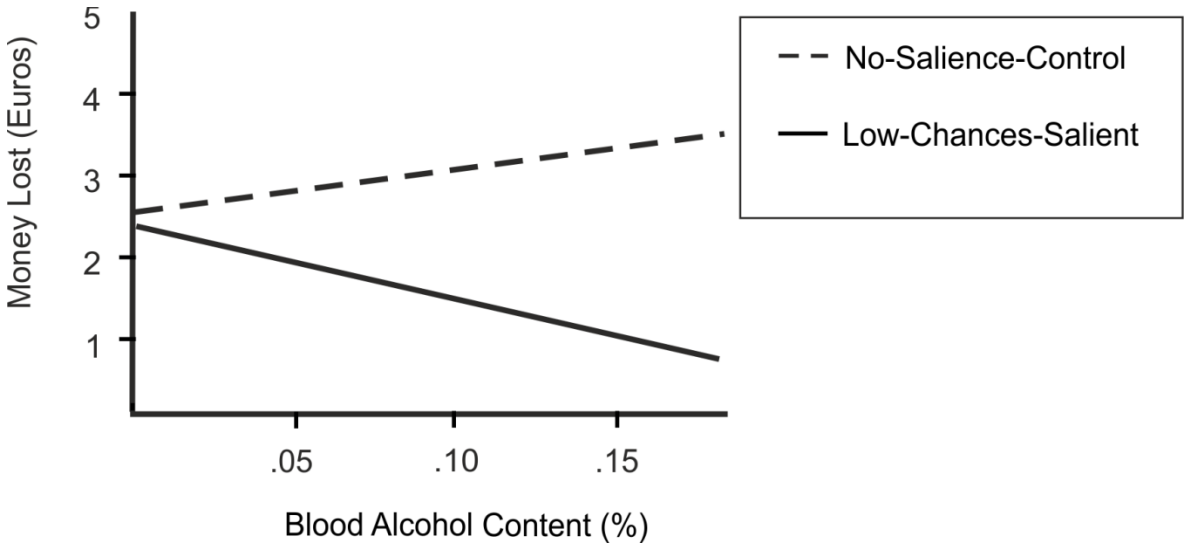


Figure 9b. Regression line showing money lost as a function of BAC and condition (0 = low-chances-salient, 1 = no-salience-control) in Study 3.

.

Appendix

Materials

Questionnaire Telephone Interview

Datum (TT.MM.JJJJ) _____

Interviewer _____

Wie auf die Studie aufmerksam geworden?

1. Demografische Daten

1. Ihr Geschlecht?

☐ männlich ☐ weiblich

2. Wie alt sind Sie? _____
3. Haben Sie schon einmal an einem Experiment des Fachbereichs Psychologie teilgenommen, bei dem Alkohol konsumiert wurde?

☐ Ja ☐ Nein

Wenn „Ja“, an welchem _____

4. Welche ist Ihre Muttersprache? _____

2. 1. Fragen zum Alkoholkonsum

Nun würde ich Ihnen gerne einige Fragen zu Ihrem gewöhnlichen Alkoholtrinkverhalten stellen. Bitte versuchen Sie die Fragen so ehrlich wie möglich zu beantworten.

1. Wie oft in der Woche trinken Sie alkoholische Getränke?

_____

2. Wie viele Drinks konsumieren Sie bei einer typischen Gelegenheit, zu der Sie trinken?
   (1 alkoholisches Getränk = 0,2l Bier oder 0,1l Wein/Sekt oder 2 einfache Gläser (2cl) Spirituosen)

_____

3. Wie lange dauert bei Ihnen eine typische Gelegenheit, zu der Sie Alkohol trinken? (Stunden)

_____

4. Nehmen Sie gegenwärtig irgendwelche Medikamente ein? (außer Verhütungsmittel/ Vitaminpräparate)

☐ Ja ☐ Nein

Welche? _____

5. Sind Sie derzeit schwanger oder besteht der Verdacht auf eine Schwangerschaft?

☐ Ja ☐ Nein

2. 2. BMAST

1. Haben Sie das Gefühl, dass Sie normal trinken? (Unter normal verstehen wir, dass Sie weniger oder genauso viel trinken wie die meisten anderen Menschen)
   □ Ja □ Nein
2. Meinen Ihre Freunde und Verwandten, dass Ihr Alkoholkonsum normal ist?
   □ Ja □ Nein
3. Haben Sie schon einmal an einem Treffen einer Selbsthilfegruppe für Alkoholabhängige teilgenommen?
   □ Ja □ Nein
4. Haben Sie einmal einen Partner wegen Ihres Trinkens verloren?
   □ Ja □ Nein
5. Haben Sie wegen Ihres Trinkens einmal Probleme am Arbeitsplatz bekommen?
   □ Ja □ Nein
6. Haben Sie zwei oder drei Tage nacheinander Ihre Verpflichtungen in Ihrer Familie oder in Ihrer Arbeit vernachlässigt, weil Sie Alkohol getrunken haben?
   □ Ja □ Nein
7. Haben Sie sich einmal an jemanden um Hilfe gewandt wegen Ihres Alkoholkonsums?
   □ Ja □ Nein
8. Waren Sie einmal in einem Krankenhaus wegen Ihres Alkoholkonsums?
   □ Ja □ Nein
9. Sind Sie schon einmal wegen Trunkenheit in Gewahrsam genommen worden?
   □ Ja □ Nein
10. Sind Sie schon einmal wegen Alkohol am Steuer von der Polizei am Weiterfahren gehindert worden?
    □ Ja □ Nein

4. Fragen zum Glücksspielverhalten

1. Haben Sie in den letzten 3 Monaten an einer oder mehreren Formen eines Glücksspiels teilgenommen?

□ Ja □ Nein

2. Ich werde Ihnen nun eine Reihe von Glücksspielen vorlesen. Bitte geben Sie an, an welcher der genannten Spielart sie in Ihrem Leben teilgenommen haben. Bitte antworten Sie mit den Kategorien „niemals“, „weniger als einmal die Woche“ oder „ein bis mehrmals die Woche“.

	niemals	weniger als einmal die Woche	ein bis mehrmals die Woche
a. Kartenspielen um Geld	□	□	□
b. Pferdewetten, Hunde- oder Tierwetten	□	□	□
c. Sportwetten	□	□	□
d. Würfelspiele um Geld	□	□	□
e. Spiele im Kasino (legal o. Illegal)	□	□	□
f. Lotterie- o. Totospiele	□	□	□
g. Bingo um Geld	□	□	□
h. Spiele an der Börse oder auf dem Optionsmarkt	□	□	□

i. Geldautomatenspiele jeglicher Art	☐	☐	☐
j. Geschicklichkeitsspiele (z.B. Bowling, Billard, Golf usw.) mit Geldeinsatz	☐	☐	☐
k. Rubbellotterien oder andere „Papierspiele“	☐	☐	☐
l. Andere Spielarten, die hier nicht aufgelistet sind	☐	☐	☐

Bitte benennen:_____

3. Wenn Sie spielen, wie häufig versuchen Sie an einem der nächsten Tage durch erneutes Spielen Geldverluste zurückzugewinnen?

☐ niemals
☐ manchmal (weniger als die Hälfte der Male, bei denen ich Geld verloren habe)
☐ bei Geldverlusten meistens
☐ immer nach Geldverlusten

4. Haben Sie jemals behauptet, dass Sie beim Spielen Geld gewonnen haben, obwohl Sie in Wirklichkeit verloren hatten?

☐ niemals (oder nie gespielt)
☐ ja, weniger als die Hälfte der Male, bei denen ich verloren hatte
☐ ja, meistens

5. Haben Sie den Eindruck, Sie hatten jemals ein Problem mit Geldwetten oder Geldspielen?

☐ nein
☐ ja, in der Vergangenheit, aber nicht jetzt
☐ ja

6. Haben Sie jemals mehr gespielt, als Sie beabsichtigt hatten?

☐ ja
☐ nein

7. Haben andere Menschen Ihr Wettverhalten kritisiert oder Ihnen gesagt, Sie hätten ein Spielproblem, unabhängig davon, ob Sie dem zustimmten oder nicht?

☐ ja
☐ nein

8. Haben Sie sich jemals schuldig gefühlt in Bezug auf die Art, wie Sie spielen oder was passiert, wenn Sie spielen?

☐ ja
☐ nein

9. Hatten Sie jemals den Wunsch, mit dem Spielen oder Wetten aufzuhören, fühlten sich aber gleichzeitig unfähig dazu?

☐ ja
☐ nein

10. Haben Sie jemals Spielbelege, Lotterietickets, Spielgeld, Schuldscheine oder andere Anzeichen für Wetten oder Spielen vor Ihrem Ehe-/Lebenspartner, Ihren Kindern oder anderen wichtigen Personen aus Ihrem Leben versteckt?

☐ ja
☐ nein

11. Haben Sie jemals mit Menschen, mit denen Sie zusammenleben, über Ihren Umgang mit Geld gestritten und war dieser Streit jemals nachträglich auf Ihr Spielverhalten bezogen?

☐ ja
☐ nein

12. Haben Sie sich jemals von jemandem Geld geliehen und dieses aufgrund Ihres Spielens nicht zurückbezahlt?

☐ ja
☐ nein

13. Haben Sie jemals während der Arbeitszeit/ während des Schulunterrichtes gefehlt, um zu spielen?

☐ ja
☐ nein

14. Wenn Sie sich Geld geliehen haben zum Spielen oder für die Rückzahlung von Spielschulden, wo oder von wem liehen Sie es? (Überprüfen Sie bei jedem Mal, ob „ja“ oder „nein“)

	ja	nein
a. vom Haushaltsgeld	☐	☐
b. vom Ehe-/Lebenspartner	☐	☐
c. von anderen Verwandten (auch angeheiratete)	☐	☐
d. von Banken oder Kreditinstituten	☐	☐
e. über Kreditkarten	☐	☐
f. von „Geldhaien“	☐	☐
g. vom Verkauf von Aktien, Wertpapieren oder anderen Anlagen	☐	☐
h. vom Verkauf von persönlichem oder familiärem Vermögen/ Einkommen	☐	☐
i. durch Ausstellung ungedeckter Schecks	☐	☐
j. ich habe (hatte) einen Kredit bei einem Buchmacher	☐	☐
k. ich habe (hatte) einen Kredit bei einem Kasino	☐	☐

5. Absprache Termin

1. Termin für die Teilnahme: ___.___.2015 ___:___ Uhr
2. Termin für die Teilnahme: ___.___.2015 ___:___ Uhr
3. Termin für die Teilnahme: ___.___.2015 ___:___ Uhr

6. E-Mailadresse für Unipark-Link: _____

Vielen Dank für Ihre Teilnahme!

Placebo Manipulation Check

1. Wie berauscht fühlen Sie sich momentan?

❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Überhaupt nicht									Sehr

2. Wie sehr spüren Sie den Effekt des Alkohols?

❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
Überhaupt nicht									Sehr

3. Wie viel Alkohol, schätzen Sie, haben Sie während des Experimentes konsumiert? (Angaben in Flaschen Bier – 0,33l)

❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑	❑
0	0,5	1	1,5	2	2,5	3	3,5	4	4,5	5	5,5	6

Assessment of Subjective Chances of Winning

1. Wie hoch würden Sie Ihre Gewinnchancen auf den Hauptpreis einschätzen?

❑	❑	❑	❑	❑	❑	❑
Sehr klein						Sehr groß

2. Wie attraktiv finden Sie den Hauptpreis?

❑	❑	❑	❑	❑	❑	❑
Sehr unattraktiv						Sehr attraktiv

Questionnaire Eye-Tracking

1. Tragen Sie eine Sehhilfe?

❑ Nein ❑ Brille ❑ Kontaktlinsen

2. Haben Sie bei der heutigen Testung eine Sehhilfe getragen?

❑ Nein ❑ Brille ❑ Kontaktlinsen

3. Haben Sie eine visuelle Beeinträchtigung wie z.B. eine Hornhautverkrümmung oder Farbenblindheit?

❑ Ja ❑ Nein ❑ Ich weiß es nicht

Danksagung

Mein Dank gilt zunächst der Konrad-Adenauer-Stiftung, die die vorliegende Forschungsarbeit ideell und finanziell gefördert hat. Außerdem wurde diese Forschungsarbeit durch die Deutsche Forschungsgemeinschaft (Grant SE 1854/2-1) finanziell unterstützt.

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