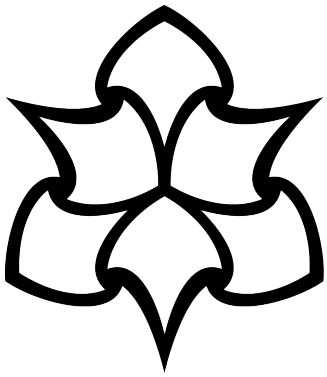

Group Dynamics: Theory, Research, and Practice

The Shuffleboard Game: Investigating group drinking, mood and risky behaviour

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Abstract

Objective: Existing research examining how social forces and alcohol interact to impact risky behaviours has yielded contrasting findings, possibly due to the nature and variety of risk-taking tasks used and the failure to consider the role of emotion. Using a novel risk-task, akin to real world drinking games, this study examines the effect of intoxication and group contexts on risk-taking, considering mediating effects of mood. ***Method:*** 132 social drinkers (83 female) consumed an alcoholic (0.8g/kg) or placebo beverage before participating in the shuffleboard game (designed to mimic real drinking games) either individually (N = 66) or in the presence of two friends (N = 66). Mood was assessed before and after beverage consumption. ***Results:*** When controlling for group identity, intoxication (versus placebo) was associated with significantly higher risk-taking, although there was no impact of group context. No interaction between context and intoxication was observed, and mood did not mediate this relationship. ***Conclusions:*** Intoxication increases risk-taking behaviour regardless of whether an individual is in a group, or isolated, whereas groups do not appear to enhance risky behaviour. Previous evidence of an effect of groups on risk-taking may have been due to a failure to control for the effect of group identity. To reduce risky behaviours, interventions may benefit from targeting alcohol use while considering how pre-existing social norms within a friendship group may either mitigate or exacerbate risk. Results affirm the importance of considering both intoxication and group effects on affective states when investigating risk-taking behaviours.

Keywords: alcohol, groups, risk-taking, impulsivity, mood

Highlights and Implications

- Alcohol consumption increases physical risk-taking in a novel shuffleboard game.
- Individuals do not always behave riskier in groups of friends, when accounting for differences in group identity.
- Intoxication and group contexts influence affective states, although mood does not mediate the relationship between alcohol consumption, group contexts and individual risk-taking.
- As the effect of alcohol on individual risk-taking remains irrespective of group context, it is important for intervention efforts to consider the role of intoxication when targeting risky behaviours.
- When seeking to understand alcohol consumption and risk-taking in social settings, the complexities of social groups, including pre-existing norms and identities, need to be accounted for.

The Shuffleboard Game: Investigating group drinking, mood and risky behaviour

The link between alcohol consumption and increased risk-taking behaviour is well documented (Lane et al., 2004; Rose et al., 2014). However, most experimental alcohol research focuses on behaviours in isolated laboratory contexts, often neglecting contributing social factors accompanying drinking in real world environments. Moreover, existing studies examining how group contexts and intoxication impact risk-taking yield inconsistent findings (Abrams et al., 2006; Erskine-Shaw et al., 2017; Sayette, Dimoff, et al., 2012) and use tasks which do not always bear resemblance to real life intoxicated risk-taking. As strategies for targeting alcohol-related risky behaviours are more likely to be effective when they are sensitive to contextual influences in real-life drinking environments (Monk & Heim, 2013), further research is needed to unpick how pharmacological and social factors interact to shape intoxicated risk-taking.

Alcohol and risk-taking

Experimental alcohol administration studies have tended to find that consumption of alcohol (compared to placebo or control) increases risk-taking behaviour and decisions across varying risk domains, including driving (Fillmore & Van Dyke, 2020; Rezaee-Zavareh et al., 2017) and gambling (Bidwell et al., 2013; Ellery & Stewart, 2014), and when employing a variety of computerised tasks (Harmon et al., 2021; Rose et al., 2014). Theoretical explanations of alcohol-induced risk-taking primarily focus on the effects of intoxication on cognitive processes such as inhibition, attention, and systematic evaluation (Dry et al., 2012). For example, the alcohol myopia model (AMM; Steele & Josephs, 1988, 1990) posits that changes in risk-taking behaviour (or decisions) are due to an alcohol-induced myopic effect on attention (to the most salient, easy-to-process cues), which subsequently impedes full systematic evaluation of situations. Applied to the study of aggression (Giancola et al., 2010) and gambling (George et al., 2005) related risk taking, it is

also often used to understand intoxicated sexual risk-taking (Lyvers et al., 2011; Monahan & Lannutti, 2000; Morris & Albery, 2001).

Initial findings and explanations of alcohol effects on risk-taking are well supported and provide important insight into the acute effects of alcohol on potentially problematic behaviours. However, some experimental research has also found negligible effects of alcohol on risk-taking (Bregu et al., 2017; Erskine-Shaw et al., 2017; Karlsson et al., 2021; Peacock et al., 2013), potentially due to the varied risk-taking tasks utilised (Harmon et al., 2021). Furthermore, when interpreting these findings, it is important to consider that alcohol consumption is often a group activity (Gordon et al., 2012) and that this can shape intoxicated behaviours (Levine et al., 2012). Despite this, research has mostly been conducted on isolated individuals in laboratory contexts and it is important to begin to shift the focus to groups in other settings.

Group influences on risk-taking

Independent of alcohol use, group contexts are important factors in understanding risk-taking - both collectively as part of a group and individually within a group context. Early work by Stoner (1961) coined the term 'the risky shift', suggesting that group choices tend to be riskier than those made by individuals, and this has been supported in more contemporary research (Blakemore & Mills, 2014; Reynolds et al., 2013). There is, however, little understanding of this phenomenon and Stoner himself argued that groups may also produce more cautious decisions dependent on the risk scenario (Stoner, 1968).

Alternatively, group monitoring perspectives highlight that more optimal decisions can be reached by groups (e.g., due to the sharing of ideas and information (Laughlin & Ellis, 1986; Mesmer-Magnus & Dechurch, 2009), and that groups may also protect against deficits in decision-making brought about by factors such as intoxication (Abrams et al., 2006) and fatigue (Frings, 2011). However, the most optimal choice is not always synonymous with the most cautious decision (Duell & Steinberg, 2019; Fryt & Szczygiel, 2021) and, as such, group monitoring processes may promote

riskier decisions in some situations. Moreover, according to the discontinuity effect (Wildschut et al., 2002, 2003), groups are generally more competitive than individuals and may be more willing to take risks to achieve their goals. Consequently, if risk-taking scenarios have a competitive element, or are perceived through a competitive lens, groups are likely to enhance (rather than protect against) risk-taking behaviour. It is therefore important that the type and context of risk-taking is carefully considered when interpreting group effects.

Finally, when addressing group influence on risk-taking behaviour, it is necessary to consider the characteristics of group members. In real-world scenarios, drinking groups are often composed of well-acquainted peers and so pre-existing social norms are likely to influence behaviour and decisions (Berkowitz, 2005; Festinger, 1954; Tajfel & Turner, 1986); a notion well supported when considering risk-taking behaviours (Borsari & Carey, 2001; Monk & Heim, 2014). It is therefore possible that the nature of group influence will differ as a function of the makeup of the group. Accounting for shared identities and norms present within groups may therefore aid in unpicking the effects of social and normative influences on risk-taking.

Group influence, alcohol use and risk-taking

Existing research on how social influence interacts with intoxication to shape risk-taking has yielded somewhat mixed findings in relation to either protective (Abrams et al., 2006; Hopthrow et al., 2014) or elevated (Sayette et al., 2004; Sayette, Dimoff, et al., 2012) effects of groups on alcohol-induced risk-taking. Abrams et al. (2006), for example, investigated individual and group risk-attraction to a series of duplex bets following an alcoholic or placebo beverage and found that alcohol (compared to placebo) increased risk-taking in individuals, but not in groups. Such findings point to the potential that group monitoring may buffer the effects of intoxication on risk-taking behaviour. Investigations of this in campus bars and music events (Hopthrow et al., 2014) provide further support for the group monitoring hypothesis in naturalistic settings, suggesting that not only do groups protect against alcohol-induced risk-taking, but also that intoxicated groups are found to

be more risk-adverse (on choice dilemmas; Kogan & Wallach, 1964) than sober groups. Reduced (as opposed to similar) risk-taking between sober and intoxicated groups could in part be due to the differences in the control condition, as Abrams and colleagues used a placebo design which may therefore have still produced anticipatory effects (McNeill et al., 2021). Alternatively, in accordance with the AMM (Steele & Josephs, 1988), narrowed attention towards the group as the most salient cue, may have augmented group monitoring when investigated with real friendship groups (opposed to research-appointed groups) in naturalistic settings. Both Abrams et al. (2006) and Hopthrow et al. (2014) utilised risk measures which encouraged systematic evaluation of a scenario (duplex bet or choice dilemma), requiring vigilance (c.f., Frings et al., 2008, for similar findings on vigilance errors) and, as such, both studies suggest that groups compensate for alcohol effects on deliberated (opposed to impulsive) risk-taking.

In contrast, alcohol administration research by Sayette and colleagues (2004;2012) found that individual risk-choice (a binary measure choosing either the risky or safe choice) was not affected by alcohol or placebo (compared to a control, with no alcohol expectation), whereas groups who consumed alcohol or placebo were significantly more likely to opt for the risky choice, compared to those who did not drink (or expect) alcohol. This supports the notion that groups enhance (rather than compensate for) alcohol-induced risk-taking. However, Sayette, Dimoff, et al. (2012) suggest that the binary measure of risk (with equal expected utility) used in the study, was not suited to group monitoring. Furthermore, the risk decision was communicated with a potential reward (finishing the study early). Therefore, an alcohol-induced myopic effect on attention may have led to prioritisation of group benefits (in the group condition), and this may have enhanced the likelihood of choosing the risky option to benefit the group.

Adding further to these variable findings, research measuring risk-taking behaviour of sober (placebo) and intoxicated individuals in group contexts (opposed to a collective group decision), found that risk-taking was significantly higher in group contexts (compared to isolation), regardless

of beverage consumed (Erskine-Shaw et al., 2017). As choices were made individually, this research does not lend itself well to group monitoring perspectives but does provide some support for the risky shift (Stoner, 1961). It is also possible that in accordance with the discontinuity effect (Wildschut et al., 2003), individuals were more likely to view the task through a competitive lens when in a group context, and therefore took risks to achieve the highest scores. In short, while initially curious, the discrepant findings in this area of research may, in part at least, be due to methodological differences in the measurement and context of risk, which may require differing group processes. These considerations are also important when understanding the varied risk-taking behaviours evident in in settings more akin to those found in the real world.

Risk-taking measurement

Researchers have used a large repertoire of risk-taking measurements which include computerised lab tasks (Harmon et al., 2021; Lejuez et al., 2002), self-report questionnaires (de Haan et al., 2011; Erskine-Shaw et al., 2017), choice dilemmas (Hopthrow et al., 2014; Kogan & Wallach, 1964), and gambling tasks (Abrams et al., 2006). These experimental paradigms have been a valuable means for researchers to unpick, in controlled settings and with ethical safeguards in mind, the extent to which alcohol and social contexts interact to shape risk-taking behaviour. However, the risk-taking tasks used to date in alcohol-related research, have tended to be hypothetical and/or relied on participants to self-assess risky behaviour. As such, while previous research has elucidated the nature of alcohol-related risk taking in social situations, it remains unclear whether such tasks, frequently reliant on self-report data, fully capture risk taking behaviour which may be more impulsive. Furthermore, when intoxicated, performance on some tasks may be a result of intoxication effects on numerical skills or navigating complex tasks/situations (Dave et al., 2010) and, as such, simpler tasks which are more akin to real-world drinking contexts may be more suitable. Tasks involved in drinking games, for example, may offer more simple and familiar tasks for participants to engage with, while still providing an assessment of risk-taking. Many drinking game

tasks include a competitive and/or skill element and performance has both incentives and consequences which often centre around further alcohol consumption (LaBrie et al., 2013). Not only is participation in such games often risky (e.g., due to excessive alcohol consumption), but playing such drinking games has also been associated with negative consequences (Zamboanga et al., 2014). Researchers may therefore benefit from utilising tasks involved in drinking games, due to their ability to measure physical (opposed to hypothetical) risk-taking behaviour, while also being familiar and more representative of the actual activities performed in social drinking environments.

A further issue for risk-related alcohol research relates to the multifaceted nature of 'risk-taking' encompassing both (i) deliberate and reflective decision, and (ii) impulsive risk-taking (Heinz et al., 2011). In some research, trait impulsivity is positively related to behavioural measures of risk-taking (Lauriola et al., 2014), while other studies find negligible associations, thus suggesting that they are not synonymous constructs (Stamates & Lau-Barraco, 2017). Differences in risk-taking tasks in the extent to which they entail deliberate or impulsive decisions may therefore be a reason for observed variations in previous findings. When examining the impact of intoxication on risk-taking, it is therefore worthwhile to establish its association with trait measures encompassing both impulsivity and general risk-taking.

Mood as a mediator

As discussed, alcohol-induced risk-taking is often explained by an impaired ability to weigh up all consequences when intoxicated (Steele & Josephs, 1988). This perspective therefore suggests that, to a greater or lesser extent, risks are evaluated analytically based on probabilities of reward and consequence, differing from more impulsive risk-taking. However, dual process models of risk-taking behaviour offer some explanation of the way in which risk-taking may be associated with both analytical and affective processes (Heinz et al., 2011; van Gelder et al., 2009), emphasising the added importance of affective states in shaping subsequent risk-taking behaviour. Indeed, research suggests that lower (dysphoric) moods are associated with more cautious decisions (Yuen & Lee,

2003), while positive moods may enhance risk-taking (Herman et al., 2018; Watson et al., 1999) although these associations may differ when risk-taking is impulsive (see Herman et al., 2018). Notably, expected affect (Fromme et al., 1997) and the positive or negative framing of a risk scenario (Xie & Wang, 2003), also influence risk decisions, highlighting the importance of both actual and expected affective states on risk-taking.

The influence of mood on risk taking behaviours is further assumed in approach and avoidance explanations of group risk-taking (Park & Hinsz, 2006, 2015), which suggest that groups (compared to individuals) tend to be associated with reward and enhanced resources, and that being in a group induces approach motivation (likelihood to take risks), which is linked to positive mood. In support, Park and Hinsz (2015) found that induced positive mood was sustained, and negative mood lifted following group interaction, whereas induced positive mood diminished and there was no change in negative mood when participants were alone. Moreover, enhanced mood is associated with activation of the behavioural approach system, which increases the perceived likelihood of reward thereby further encouraging risk-taking (Watson et al., 1999). In addition to group influence on mood, alcohol use is also indicated in mood enhancement (Fairbairn & Sayette, 2014; Lowe et al., 2013; Sayette, 2017; Sayette, Creswell, et al., 2012; for a recent review see Tovmasyan et al., 2022), with varying explanations from pharmacological, cognitive and social perspectives (Sayette, 2017). This highlights the possibility that the relationship between social (group) drinking and risk-taking behaviour may in part, be mediated by mood.

The current study

With the above in mind, the aim of the current study is to examine the impact of intoxication, group contexts and affective states on individual risk-taking behaviour using a task which is more representative of those featuring real-world drinking settings. It is hypothesised that social drinking will increase individual risk-taking behaviour to a greater extent than drinking in isolation and placebo consumption, and that this is in part, mediated by affective state. More

specifically, as the risk-taking task in the current study is anticipated to be viewed through a competitive lens (using a leader board), it is predicted that in line with the discontinuity effect and the AMM, groups contexts will enhance individual risk-taking, and that this will be exaggerated by intoxication. Furthermore, it is predicted that positive mood will mediate the relationship between intoxication / group contexts and individual risk-taking behaviour. Finally, it is expected that differences between friendship groups (and therefore group identity) will play a part in this association.

Method

All measures, conditions, and data exclusions are reported.

Design

This experimental study used a 2 (beverage: alcohol versus placebo) x 2 (context: isolation versus groups) between participant design.

Participants

Social drinkers (*N*=132) who drank at least once a week and were not attempting to reduce their consumption were recruited, via opportunity sampling at a UK university[1]. Participants responded to recruitment posters, shared around a university campus, that advertised for social drinkers who would be interested in participating individually or as a group of three (in order that we could recruit natural friendship groups). Interested participants were requested to confirm (via email) whether they would be attending the session alone or with two friends. There were a total of 132 participants: 66 attended the laboratory individually, and 22 came with two friends (66 participants in a group context). The mean age of participants was 20 (*SD*=2.34), and 63% were

[1] An a priori power analysis conducted using G*Power 3.1.9.2, based on a medium effect size (informed by previous research; Abrams et al., 2006; Erskine-Shaw et al., 2017; Hopthrow et al., 2014; Sayette, Dimoff, et al., 2012) revealed a minimum of 120 participants to achieve a power of .80.

female. A participant information sheet detailed our inclusion criteria, ensuring that all participants were aged 18 and above and consumed alcohol at least once a week, socially (although there was no specific requirement that those participating in groups commonly consumed alcohol within this friendship group). Adherence with inclusion and exclusion criteria was further assessed (via questionnaire) and conformed that all were in good health, not pregnant, trying to conceive or breastfeeding, not taking any medication which could interact with alcohol, and had no history of alcohol-related issues. All participants provided informed consent and agreement with the inclusion and exclusion criteria before commencing the study.

Materials and Measures

Beverage administration

In a single-blind design, participants were randomly allocated to consume 0.8g/kg of alcohol, or placebo beverage (procedures adapted from previous studies; Abrams et al., 2006; Rose et al., 2014; Rose & Duka, 2006). The alcohol condition consisted of vodka combined with equal amounts of orange juice and tonic water. Placebo beverages contained equal amounts of orange juice and tonic water, matching the volume given in the alcohol condition. Before consumption, participants were given a strong-tasting lozenge ('Fisherman's Friend') to mask the taste of the beverages. To enhance perception of alcohol consumption, vodka mist was sprayed on the surface of the placebo drink and applied to the rim of the glass (the amount of alcohol here was not sufficient to be identified by a breath alcohol reading). For each condition, the beverages were separated across three glasses, consumed across 10 minutes. Those who were participating in group contexts consumed their beverages together while seated around a circular table, and all received the same beverage. During this time, they were permitted to talk but it was requested that they did not discuss the study.

Questionnaires

Alcohol Use Disorder Identification Test (AUDIT; Saunders et al., 1993). The AUDIT consists of 10 questions measuring harmful and hazardous alcohol consumption, with high internal reliability in the current sample (Cronbach's $\alpha = .76$).

Barratt Impulsivity Scale (BIS-11; Patton et al., 1995). The BIS-11 measures trait impulsivity, including three subscales of attentional, motor, and non-planning impulsivity. The questionnaire consists of 30 statements, which are rated on a four-point scale from 'strongly disagree' to 'strongly agree'. Total BIS-11 score and non-planning subscale had high reliability (all Cronbach's $\alpha > .73$). The attentional (Cronbach's $\alpha = .62$) and motor impulsivity (Cronbach's $\alpha = .58$) subscales had low to acceptable reliability.

RT-18 (de Haan et al., 2011). The 18-item scale measures trait risk-taking via yes/no answers to a selection of statements, in addition to two subscales: risk-assessment and risk-behaviour. All subscales and total RT-18 score had high reliability (all Cronbach's $\alpha > .72$).

Mood and subjective intoxication visual analogue scales (VAS). The questionnaire consists of 10 VAS measuring 100mm, with anchors of 'not at all' and 'extremely'. Mood is assessed across three positive and three negative affective states (e.g. 'happy' and 'sad'), showing high reliability before and following alcohol and placebo (all Cronbach's $\alpha > .76$). Subjective intoxication is measured across two intoxicated and two sober states (e.g. 'drunk' and 'clearheaded'), with high reliability post alcohol and placebo consumption (all Cronbach's $\alpha > .77$).

Group questionnaire. Two questions assessed the relationship between participants who completed the study within a group context. The first question required participants to state whether they were acquaintances or friends with the other group members. The second question asked if they engaged in activities involving drinking with the other members of their group, and whether this was regular or occasional. The questionnaire aimed to provide an understanding of the sample collected. It was mandatory that participants were friends (opposed to acquaintances) but there was no requirement regarding the frequency of which group members drank alcohol together.

Risk-taking task

The Shuffleboard Game[2] . An adapted version of the shuffleboard game was developed to measure risk-taking behaviour. Previous versions (Kogan & Wallach, 1964; Miller & Byrnes, 1997) entailed sliding a coin along a shuffleboard table whilst avoiding touching markers (of varying width) on either side of the table. In this modified version, participants slid an empty beer bottle along a 240cm Perspex-covered table with an aim to land in one of four scoring zones (divided by straight lines across the width of the table). The length of the scoring zones decreases, as the rewarded points increase: 10 points was scored for landing the bottle between 90-150cm (60cm zone), 20 points between 150-195cm (45cm zone), 50 points between 195-225cm (30cm zone), and 100 points between 225-240cm (15cm zone). If the bottle slid through the 100-point zone and off the table, there was a penalty of -25 points. Each participant completed one practice trial, and three test trials with the objective of scoring as many points as possible. The aim of a single practice trial was to familiarise themselves with the weight of the bottle and ascertain understanding of the task, while avoiding too much skill development (e.g., determining the ideal force of slide to achieve the top points). A leader board was made visible to all participants with the 'top five scores' as an incentive to score highly and to encourage a competitive element to the task. Risk-taking is measured by the average distance of the bottle slide across test trials, with a larger distance indicating higher risk-taking. In the case of a penalty, 25cm was added to the total length of the board (equalling 265cm).

As the research was interested in investigating the effect of social contexts, it was important that participants in the group context condition were together, and able to watch and communicate during the shuffleboard task. Nevertheless, participants were told that they would receive a score

[2] Pilot tests were conducted to identify the best bottle type for use on the shuffleboard. Different bottles showed varying balance when being pushed across the table and some appeared to generate more friction between the bottle and the Perspex shuffleboard, meaning that a push of equitable force resulted in varying recorded travel distances. We therefore selected the same branded beer bottle for all tests to control for such variability and to standardise the procedure.

individually, to more closely align with the research aim of investigating group contexts on individual behaviour. To reduce the likelihood of participants in this condition learning from others' performance, it was requested that they did not share any tips/advice (and a researcher was present to control this). Further, each member took turns to play one trial each on the task before moving on to the next trial. This was important for two reasons: First, to reduce and standardise group member variations in time from beverage consumption to task completion. In other words, participants completing trial 1 of the task did so at a similar time, meaning that any variability in performance as a product of increasing time between consumption and task involvement (changing BrAC) was standardised. Second, to ensure that all group members were able to view others' performance while completing the task themselves. For example, if the first group member completed the practice and all three trials in succession, they would view only their own performance, whereas the second and third member to complete the shuffleboard task would have the opportunity to learn from one or two prior group members, respectively.

Group identity

Group identity was coded within the multi-level model by controlling for group level differences between the natural friendship groups recruited for the study. For example, in the group context condition, individuals are nested within one of 22 natural friendship groups, which are then nested within either an alcohol or placebo beverage condition. The multi-level model therefore models the impact of intoxication and group context while also controlling for differences between the natural friendship groups, therefore accounting for group identity.

Procedure

All materials and procedures were ethically approved via the university's research ethics committee. Participants attended the Psychology department individually or in a group of three between 12:00-19:00, Monday-Friday. It was requested that participants avoid alcohol for 12 hours and eating for three hours prior to testing and on arrival they were breathalysed to confirm sobriety.

Those who participated in a group context completed all questionnaires, beverage consumption and the shuffleboard task individually, but in the presence of each other. Participants were requested to not discuss their answers on the questionnaires but were permitted to communicate throughout the study. Participants were in close proximity, seated around a circular table during most of the study, to mimic seating in a natural consumption environment such as a bar. During the shuffleboard game, participants stood close to each other, at the front of the shuffleboard table to enable them to observe other individuals' performance.

Participants started by completing the BIS-11, RT-18, mood and subjective intoxication VAS. Those who participated in group contexts were also required to complete a further two questions to confirm their relationship and social drinking habits with the other group members. Following this, participants were randomly allocated to consume either alcohol or placebo (all group members consumed the same beverage type) before resting for 20 minutes to ensure testing on the ascending limb of the blood alcohol curve (Rose & Duka, 2006). Participants were then breathalysed and asked to complete a second set of the mood and subjective intoxication VAS, before proceeding onto the shuffleboard game. Finally, participants were debriefed, breathalysed, and asked to stay within the laboratory until their BrAC was below 0.14mg/l (or else sign a disclaimer before leaving). All participants were compensated individually for participating.

Analytic Strategy

Preliminary analysis

First, little's missing completely at random (MCAR) tests (Little, 1988) confirmed that missing values (< 1.2%) were missing completely at random, and therefore, estimation maximisation was performed to adjust and insert values into empty cells using information from the data set (Tabachnick & Fidell, 2007). Analyses were then conducted via t-tests to check for condition level differences in alcohol consumption behaviour, trait risk-taking, impulsivity, and baseline mood. ANOVA and simple main effects analysis tested the success of placebo manipulation assessing

differences in subjective intoxication scores (baseline to post-beverage) by beverage type (placebo versus alcohol). Multiple correlations were carried out to establish whether risk-taking scores from the shuffleboard game were significantly associated with self-reported risk-taking and trait impulsivity scores. As attentional and non-planning impulsivity significantly correlated with risk-taking via the shuffleboard, all further analyses controlled for these sub-types of impulsivity, as covariates. Correlational analysis was also conducted on variables included in later mediation analysis: context (isolated = 1, group = 2), beverage (placebo = 1, alcohol = 2), positive and negative mood taken 20 minutes post-beverage consumption, and risk-taking via the shuffleboard.

Multi-level models, including group identity

Multilevel analysis using mixed effects regression models were carried out using the 'xtmixed' command in STATA (Rabe-Hesketh & Skrondal, 2012). This investigated the independent and combined effects of beverage (alcohol versus placebo) and context (isolated versus group) on risk-taking evidenced in shuffleboard performance (cm). For the multilevel models, each individual's group membership was identified and coded in order to control for identity-based variability between groups.

Overall, two models were tested, both including risk-taking (shuffleboard) as an outcome variable. Model 1 included social context and beverage as fixed effect predictor variables and group identity as a random effects variable to test the hypothesis that group contexts and intoxication elevate risk-taking. Model 2 introduced an interaction term to test whether both group context and intoxication exert a combined influence on individual risk-taking.

Finally, post-hoc multi-level models were conducted. These were identical to Model 1 and 2 but excluded non-planning impulsivity from the analysis. Non-planning impulsivity was significantly higher in group, compared to isolated contexts. Although trait (opposed to state) impulsivity was employed (BIS-11; Patton et al., 1995), other trait measures of impulsivity have been found to also characterise impulsive states, to some extent (Halvorson et al., 2021). The post-hoc analysis

therefore attempted to investigate whether the association (or absence of association) between context and individual risk-taking (via the shuffleboard) were indicative of disinhibiting effects of group contexts (Diener, 1979; Diener et al., 1980; Hinsz et al., 2019; Park & Hinsz, 2006).

Mediation analysis

Mediation analyses was performed using the PROCESS macro (version 2.6) for IMB SPSS Statistics 24 (Hayes, 2013). Using 5000 bootstrapped samples and 95% confidence intervals (CI), direct (*c'*) and indirect effects (*ab*) were analysed to determine whether positive and negative mood taken at time two (20 minutes following beverage consumption, prior to the risk-taking task) mediated the relationship between context (mediation model one) or beverage (mediation model 2) and risk-taking (via the Shuffleboard game) (see Figure 1). Confidence intervals which did not include zero, indicated significant indirect effects. For mediation analysis, isolated and group contexts were coded as one and two, respectively; and beverages were assigned a value of one for placebo, and two for alcohol.

Results

Preliminary Analysis

Participant's trait risk-taking, alcohol consumption behaviour, and baseline mood did not differ across conditions of beverage or context (*p*'s > .09) (see table 1). Although total, attentional and motor trait impulsivity did not significantly differ across beverage or context conditions, non-planning impulsivity was significantly higher in the group context condition, compared to the isolated condition, $t(130) = -2.60$, $p = .01$, $d = 0.45$, CI [-3.88, -0.53], and was therefore controlled for in multi-level model and mediation analyses. All participants tested in groups ($N = 66$) confirmed friendship with their group members: 65% reported drinking with each other often, 27% occasionally, and 8% claimed that they never consumed alcohol with their group members.

Breath Alcohol Concentration and Subjective Intoxication

The average breath alcohol concentration (BrAC) 20 minutes following consumption was 0.44mg/l (*SD* = .14)[3] . A 2 (beverage: alcohol versus placebo) x 2 (time: baseline versus post-beverage) mixed ANOVA, and simple main effects analysis was used to examine subjective intoxication. A main effect of time was revealed, $F(1,130) = 213.90$, $p < .001$, $\eta_p^2 = .62$. Participants felt significantly more intoxicated following both alcohol, $F(1,130) = 247.19$, $p < .001$, $\eta_p^2 = .67$, and placebo, $F(1,130) = 24.61$, $p < .001$, $\eta_p^2 = .12$, compared to baseline. An interaction of beverage and time was found, $F(1, 130) = 57.90$, $p < .001$, $\eta_p^2 = .31$; subjective intoxication was significantly higher post-consumption in the alcohol condition compared to placebo, $F(1,130) = 61.69$, $p < .001$, $\eta_p^2 = .32$.

Relationship between self-reports and the shuffleboard game performance

Trait impulsivity (BIS-11) was positively correlated with behavioural risk-taking (shuffleboard), $r(130) = .25$, $p = .005$, whereas trait risk-taking (RT-18) revealed no significant relationship, $r(130) = .06$, $p = .49$. Further correlations were conducted on BIS-11 subscales of impulsivity (Bonferroni adjusted *p*-value of .017), and RT-18 subscales of risk-taking (Bonferroni adjusted *p*-value of .025) on the shuffleboard game. A significant correlation was only revealed with attentional impulsivity, $r(130) = .22$, $p = .01$, and non-planning impulsivity, $r(130) = .22$, $p = .01$. All other correlations were insignificant, *p*s > .29 (see table 2 for all correlations, including study variables used in mediation analyses).

Correlations conducted ahead of mediation analysis (Bonferroni adjusted *p*-value of 0.017) found alcohol to be significantly negatively correlated with negative mood, $r(130) = -.28$, $p = .001$, and positively related to risk-taking on the shuffleboard, $r(130) = .22$, $p = .01$. Context (a higher

[3] The current drink-drink limit in the UK (excluding Scotland), is .35mg/l (Road Traffic Act, 1988)

score representing a group context) was also positively correlated to non-planning impulsivity, $r(130) = .22$, $p = .01$. No other correlations were significant ($p > .04$).

Context, beverage and group identity on individual risk-taking

The role of context (isolated versus group) and beverage (alcohol versus placebo) on risk-taking was assessed across two sequential models, testing the independent effects of context and beverage on individual risk-taking while accounting for group identity, and investigating the interaction of context and beverage. Parameter estimates (coefficients and estimates) are displayed in Table 3.

Model 1 found that only alcohol significantly predicted risky behaviour, whereas the relationship between context and shuffleboard performance was not significant. Group identity also did not significantly predict risk-taking behaviour. A likelihood ratio test showed model 1 to not be significant, $\chi^2(4, N = 132) = 6.95$, $p = .14$. Further, model 2 found no interaction of context and beverage on risk-taking behaviour, $\chi^2(5, N = 132) = 7.01$, $p = .22$. Overall, the multi-level analysis suggests that intoxication predicts riskier behaviour, although this relationship does not appear to be influenced by context. Furthermore, group context does not predict risky behaviour when controlling for group identity.

Post-hoc multi-level models were conducted, excluding non-planning impulsivity, and did not differ from Model 1 and 2. Only alcohol was predictive of individual riskier behaviour, whereas context was not significant. A likelihood ratio test showed that neither model 1, $\chi^2(3, N = 132) = 6.87$, $p = .08$, nor 2, $\chi^2(4, N = 132) = 6.95$, $p = .14$, was significant.

Mediating effects of mood

The first mediation model including context (isolation = 1, group = 2) as the independent variable, and mediators of positive and negative mood explained 9% of the variance in risk-taking scores, $F(5, 126) = 2.58$, $p = .03$. Groups significantly predicted lower negative mood, $b = -17.89$,

t(128) = -2.17, *p* = .04, but not positive mood (*p* = .14) (path *a*). Further, neither positive or negative mood (path *b*), or context (*c'*) predicted risk-taking (*p*s > .80). Overall, positive and negative mood did not reveal any indirect effects on the relationship between context (isolated or group) and risk-taking (positive mood *ab* = .20, 95% CI [-2.12, 2.69]; negative mood *ab* = -.17, 95% CI [-2.67, 2.52]), suggesting no evidence of a mediation effect.

The second mediation model which entered beverage (placebo = 1, alcohol = 2) as an independent variable, and positive and negative mood as mediators accounted for 14% of the variance in risk-taking, *F*(5, 126) = 4.13, *p* = .002. Intoxication significantly predicted risk-taking behaviour (*c'*), *b* = 15.38, *t*(126) = 3.06, *p* = .003. Furthermore, consuming alcohol significantly predicted both increased positive mood (*b* = 17.70, *t*(128) = 2.10, *p* < .001), and reduced negative mood (*b* = -24.61, *t*(128) = -3.10, *p* = .002) (path *a*). However, as with the first mediation model, neither positive or negative mood predicted risk-taking (path *b*), *p*s > .58, and there was no indirect effect (positive mood *ab* = .16, 95% CI [-4.01, 2.56]; negative mood *ab* = -.85, 95% CI [-4.42, 2.45]). No mediation effect of mood was found on the relationship between beverage (alcohol or placebo) on risk-taking.

Discussion

Using a measure of physical risk-taking behaviour more akin to risky social drinking games (c.f., Zamboanga et al., 2014), the current study investigated the influence of alcohol and group contexts on individual risk-taking behaviour and examined the mediating effects of mood. Consuming alcohol (compared to placebo) enhanced risk-taking behaviour, yet group context (compared to individuals in isolation) was not predictive of individual risk-taking, when accounting for group identity. Furthermore, no interaction between alcohol and group context was found, suggesting that being in a group does not alter the effect of intoxication on individual risk-taking behaviour. Findings from the mediation analysis showed that neither positive or negative mood mediated the relationships between group contexts or alcohol consumption and risk-taking behaviour. Being in a group and

consuming alcohol was associated with reduced negative mood, and intoxication was also associated with increased positive mood, whereas mood did not significantly predict individual risk-taking.

Observed increases in risk-taking behaviour following alcohol are consistent with much previous research undertaken in lab-based contexts (Lane et al., 2004; Rose et al., 2014). Furthermore, the current study provides support of this effect in a social context, suggesting that intoxication affects individual risk-taking both when alone, and when with friends. On the other hand, the current study did not reveal an association between group context and individual risk-taking when differences between friendship groups (group identity), were accounted for. This is in contrast with predictions made in accordance with the discontinuity effect (Wildschut et al., 2003), suggesting that individuals in group contexts would view the shuffleboard game as more competitive (further encouraged by the presence of a leader board) and therefore engage in more risk-taking. However, it is important to note that existing friendship groups were recruited in this current study and, as such, it is likely that pre-established group identities informing drinking behaviours were present and may have influenced risk-taking (Borsari & Carey, 2001; Kuendig & Kuntsche, 2012; Rinker & Neighbors, 2014). In similar studies (Abrams et al., 2006; Sayette, Dimoff, et al., 2012), groups have often been researcher-appointed (i.e., participants were assigned to groups of unfamiliar peers) and as such, differences in findings may be due to the influence of pre-existing group norms in familiar, compared to unfamiliar groups. Furthermore, the current work investigated group contexts on individual, as opposed to collective risk-taking (used in the aforementioned studies). This is important to note as decisions made individually in group contexts, compared to collective decisions are known to differ (Frings et al., 2008). Moreover, Wildschut et al. (2003) argue that discontinuity effect is larger when collective, opposed to individual decisions are made within a group. Yet, previous work also measuring individual risk-taking taking in group contexts (Erskine-Shaw et al., 2017), found that both alcohol and group contexts independently increased risk-taking. Such discrepant findings may be due to the different risk-taking tasks used (driving and computerised risk-taking compared to the shuffleboard game); tasks have been found to display

varying sensitivity to intoxication (see Harmon et al., 2021) which may also be the case with group influence. To this end, researchers should carefully consider the complexity of both risk-taking and natural groups when exploring social context effects. In this regard, further research is encouraged to better understand the role of group norms and identity on various alcohol-related risk-taking behaviours.

Current findings further suggest that the role of intoxication on risk-taking behaviour is not associated with context, in apparent contrast with previous work suggesting that alcohol only increases risk-taking in groups (compared to individuals) (Sayette, Dimoff, et al., 2012), or that groups provide a protective effect against alcohol-induced risk taking (Abrams et al., 2016; Hopthrow et al., 2014). However, group monitoring explanations of the protective effect of groups (Abrams et al., 2006; Hopthrow et al., 2014), were not conducive with the current study measures or procedure, as friendship groups were not asked to deliberate or collectively respond to the task. The findings may be better explained via the AMM (Steele & Josephs, 1988). Here, sober individuals tested in isolation may be likely to consider both the benefits and consequences of taking a riskier move on the shuffleboard game. In contrast, due to an alcohol-induced myopic effect on attention, intoxicated counterparts may be more likely to attend to the potential benefits of taking risks (as the most salient cue), with less consideration of the possible consequences, thus elevating risky behaviour. As the shuffleboard game points did not relate to monetary value, the potential benefits (and consequences) of risk-taking may have been less salient to sober individuals in the group context, as their attention is divided between the task in hand and their peers. In contrast, as the shuffleboard game was framed competitively as opposed to a collective group task, performance on the shuffleboard game may be viewed as more salient in intoxicated participants who were tested with peers, thus narrowing their attention to risk-taking benefits (in a similar fashion to intoxicated individual in isolation). This may explain why alcohol consumption increased risk-taking in both isolated and group contexts, whereas groups did not increase individual risk-taking compared to those tested alone. A further important consideration here, is the use of reward and penalty for risk-

taking behaviour; monetary value, or risk regarding health and wellbeing, are likely to evoke a stronger response opposed to points, which were used in the current study and are often used in other risk-taking tasks (e.g., Balloon Analogue Risk Task; Lejuez et al., 2002). Future research should therefore consider the use of monetary value to determine whether risk-taking response differs due to the potential of financial gain and loss.

The present research also casts light on the role of mood on risk-taking in social (drinking) contexts. As expected from the past research (Fairbairn & Sayette, 2014; Lowe et al., 2013; Sayette, 2017; Sayette, Creswell, et al., 2012), alcohol was associated with increased positive mood and reduced negative mood, while being in a group predicted reduced negative mood, consistent with previous work (Park & Hinsz, 2015). However, against expectations, mood was not associated with risk-taking behaviour in either mediation model and, as such, mood did not mediate the relationship between beverage or context, and individual risk-taking behaviour. Such findings are at odds with approach and avoidance explanations, suggesting that group contexts enhance positive mood, which is associated with approach behaviours (e.g., risk-taking) (see Park & Hinsz, 2006). However, Park and Hinsz (2006) identify the importance of "strength and safety in numbers" and the diffusion of responsibility in activating the behavioural approach system, which are likely to occur in situations where decisions and actions are made as a group (therefore group responsibility, opposed to individual responsibility). In the current study, participants completed the task individually in group settings and it is therefore likely, that diffusion of responsibility did not occur. To this end, group contexts, and mood are less likely to influence risk-taking behaviour when the responsibility and consequences from behaviour are assigned to the individual, opposed to the group. Moreover, it is sensible to consider that other variables may be involved in this relationship, and as such, other mediation models should not be disregarded (Fiedler et al., 2018). Future research would benefit from examining more systematically, the extent to which emotional state may direct various types of risky behaviours (including collective versus individual behaviour), and the interplay of these associations in real world social contexts.

There are some methodological considerations regarding the shuffleboard game. First, our analysis found a positive association between impulsivity and risk-taking on the shuffleboard game which has previously been demonstrated with various other risk-taking measures (Lauriola et al., 2014; Lejuez et al., 2002). It therefore seems reasonable to suggest that the risk-taking measured by the shuffleboard game is more akin to measures of impulsive risk, as opposed to deliberate thought-out risk-taking (which are not synonymous; Stamates & Lau-Barraco, 2017). The current findings should be interpreted with this in mind. Second, this measure of risk-taking requires some motor skill and co-ordination to slide the bottle in a straight line, to avoid it falling from the sides of the table. All participants were able to direct the bottle in a straight line along the table throughout the study (the bottle did not fall off the sides), suggesting that there were no substantial differences in motor coordination between participants in general, or between the sober and intoxicated conditions. As such, we suggest that observed changes are not resultant of alcohol-related motor impairment (Houa et al., 2010; Marczinski et al., 2012), but are likely to be driven via an increased inclination to take risks. Nevertheless, baseline differences in motor ability and variable responses to intoxication cannot be entirely ruled out and should therefore be controlled for in future studies.

A number of limitations need to be borne in mind when considering the current findings. Firstly, previous work indicates that placebo alcohol (Christiansen et al., 2013, 2016, 2017) and even the scent of alcohol (Monk et al., 2016) can influence alcohol-related cognitions and responses. It is therefore important to note that differences between the alcohol and placebo conditions should be interpreted as pharmacological effects only, as expectancy effects cannot be determined without comparison to a pure control beverage. We therefore advocate future research to include a pure control condition to facilitate investigation of both anticipated and pharmacological effects of alcohol on mood and risk-taking. When interpreting the current findings, it is also necessary to consider the recruitment method used in the current study, as participants chose whether to participate individually or with friends. It is, therefore, possible that those who participated in groups, were more able to find and persuade peers to participate. For example, personality traits

associated with sociability and persuasiveness (e.g., extraversion and openness; Oreg & Sverdlik, 2014) are also associated higher risk-taking propensity (Nicholson et al., 2005) and therefore, participants in group contexts may display higher risk-taking due to elevated levels of extraversion and openness. The current study did not find any group level differences in trait risk-taking but did indicate that non-planning impulsivity was elevated in individuals who participated in group, compared to isolated, contexts. Although post-hoc analyses revealed no resulting differences when including or excluding non-planning impulsivity within the models, these apparent variations in impulsivity between the context conditions highlights the importance of considering the methods used when recruiting groups for research purposes. The use of natural friendship groups is more representative of real-world behaviours, but does incur some cost to controls with regards to personality and pre-existing group norms (Kuendig & Kuntsche, 2012). Future research which aims to recruit friendship groups may therefore benefit from separating out a proportion of these volunteers for individual assessments in isolation. Assessing for pre-existing norms and related personality traits would also be advisable. In doing so, researchers would be able to further investigate whether differences in trait measures of impulsivity are indicative of impulsive state changes in group contexts. Finally, it is important to consider the sample size of the current study. An a priori power analysis revealed a minimum of 120 participants, based on a medium effect size, to capture significant effects at .80 power. However, as previous effect sizes in this area have ranged from small to medium (Abrams et al., 2006; Erskine-Shaw et al., 2017; Hopthrow et al., 2014; Sayette, Dimoff, et al., 2012), it is possible that an effect of group context would have been detected in a larger sample.

In conclusion, the current study adds to the methodological repertoire of research in this area by utilising a measure of risk-taking that is more akin to activities carried out in social drinking environments. Intoxication independently increased risk-taking, however, neither group context or the combination of both alcohol and group context were associated with individual risk behaviour. Moreover, findings suggest that group influences on risk-taking may be determined by the characteristics of existing friendship groups and, as such, point to the potential of (natural) groups to

influence and individuals' alcohol-related risk-taking in various directions (protective or enhancing). Furthermore, while mood did not mediate the relationship between either context or beverage, and risk-taking, both intoxication and group contexts predicted reduced negative (alcohol and groups) and enhanced positive (alcohol only) mood. The present results therefore suggest that it is important to consider affective states when understanding behaviours in social drinking settings. Overall, the findings highlight the importance of considering the independent effect of intoxication on risky behaviours, across both isolated and group contexts. The current study also underlines the potentially important role of group identities in shaping alcohol effects on harmful (or protective) risk-taking behaviours which may be useful to inform the development of intervention efforts seeking to harness social forces in the regulation of alcohol behaviours.

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Table 1

Descriptive statistics by context and beverage (means and standard deviations)

	Individual		Group	
	Alcohol	Placebo	Alcohol	Placebo
	(*N* = 33)	(*N* = 33)	(*N* = 33)	(*N* = 33)
Variables	*M(SD)*		*M(SD)*	
Age	20.88 (3.61)	20.12 (2.19)	19.23 (1.02)	19.45 (1.23)
AUDIT	11.27 (4.89)	11.64 (5.99)	12.97 (5.10)	13.09 (5.14)
BIS-11	64.87 (9.68)	67.46 (8.38)	68.42 (10.64)	68.89 (8.48)
RT18	9.27 (3.51)	10.04 (4.62)	9.36 (4.53)	10.46 (4.00)
Positive mood[1]	217.42 (38.18)	209.85 (44.08)	213.64 (34.28)	203.40 (37.88)
Negative mood[1]	62.64 (41.03)	74.70 (59.68)	67.18 (47.81)	85.67 (55.09)
Shuffleboard	197.98 (31.74)	186.94 (24.65)	209.46 (30.82)	195.21 (25.50)

Note. [1]Positive and negative mood as baseline (before beverage consumption)

Table 2

Correlation matrix for impulsivity (trait), risk-taking (trait and behavioural), and mediation variables

Measure	1	2	3	4	5	6	7	8	9	10	11	12
1. Shuffleboard	--											
2. BIS-11	.25**	--										
3. – Attentional[1]	.22*	.67**	--									
4. – Motor[1]	.09	.73**	.28**	--								
5. - Non-planning[1]	.23**	.81**	.31**	.37**	--							
6. RT-18	.06	.53**	.28**	.50**	.40**	--						
7. – Behaviour[1]	.02	.27*	.20*	.26*	.15	.85**	--					
8. – Assessment[1]	.09	.63**	.28**	.58**	.53**	.82**	.38**	--				
9. Positive mood[2]	.03	.03	-.03	.08	.003	.16	.18	.09	--			
10. Negative mood[2]	.03	.14	.20	.04	.08	.05	-.04	.12	-.51**	--		
11. Context[2]	.17	.13	.03	.01	.22*	.03	-.04	.10	.13	-.17	--	
12. Beverage[2]	.22*	-.08	-.13	-.01	-.05	-.11	-.08	-.11	.18*	-.28**	--	--

Note. The table demonstrates correlational analyses carried out to assess the relationship between trait impulsivity and risk-taking, with the shuffleboard game (behavioural risk-taking), and the relationship between study variables involved in the mediation analyses.

A probability note. *$p < .05$, **$p < .001$

[1]Bonferroni adjusted *p*-values have been applied to Shuffleboard correlations with BIS-11 subscales ($p < .017$) and RT-18 subscales ($p < .025$). For these correlations *$p < .017$ / .025, **$p < .001$

[2]For mediation analyses: Positive and negative mood 20 minutes following beverage consumption. Context: isolated = 1, group = 2. Beverage: placebo = 1, alcohol = 2

Table 3

Parameter estimates from a three-level model analysis

	Parameter estimates (standard errors) 95% *confidence intervals*	
	Model 1	Model 2
Fixed Effects		
Intercept	176.40 (19.18) *138.81, 213.99***	177.35 (19.58) *138.97, 215.72***
Beverage	12.83 (5.16) *2.72, 22.93**	11.85 (6.71) *-1.29, 25.00*
Context	9.61 (12.20) *-14.30, 33.52*	8.44 (13.20) *-17.44, 34.31*
Beverage X Context		2.39 (10.48) *-18.16, 22.93*
Random Effects		
Group Identity	10.99 (5.62) *4.03, 29.95*	10.94 (5.64) *3.98, 30.07*
SD (residual)	26.67 (1.88) *23.24, 30.62*	26.68 (1.88) *23.24, 30.63*

Note. *$p < .05$, **$p < .001$

Figure 1

Mediation model to assess the mediating effects of mood on the relationship between context/beverage and risk-taking via the shuffleboard.

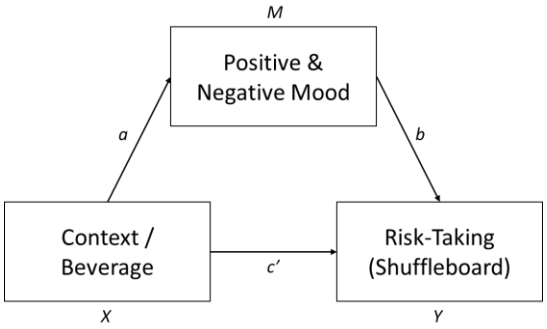

Figure 2

Risk-taking behaviour following alcohol and placebo consumption, in isolation and peer presence contexts