Dispositional disinhibition and alcohol use disorders:

Personality, risk appraisal and problematic alcohol consumption

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Abstract

Background: The relationship between psychopathic personality and problematic alcohol consumption could be important for understanding risk and potential interventions. This existing work on psychopathy and alcohol abuse is typically conducted in criminal and hospitalised populations and little attention has been paid to investigating the general populations' psychopathic personality and problematic consumption of alcohol. The psychopathy-focused Triarchic Psychopathy Measure (TriPM) and the more general Reinforcement Sensitivity Theory of personality (RST) focus on individual differences related to low self-control and sensation seeking, and could relate to problematic alcohol consumption in non-forensic samples. The current study brings together RST and psychopathic personality traits to predict alcohol use disorders. We hypothesise that impulsivity and anxiety predict problematic alcohol consumption and related risk appraisal.

Methods: We analysed data from a sample of 349 general population participants who had completed measures of the TriPM, RST, alcohol use disorders (AUDIT) and their perceived negative outcomes of high risk behaviour with the Cognitive Appraisal of Risky Events (CARE) measure.

Results: We find some evidence that TriPM's disinhibition and RST's anxious personality traits relate to AUDIT scores. We find limited evidence that personality traits predict the negative appraisal of risky events, but alcohol use was related to increased perceptions of the negative outcomes of alcohol consumption.

Conclusions: Overall this study shows that individual differences do relate to problematic alcohol consumption but not the appraisal of risks related to alcohol consumption. This has implications for the structuring of intervention for those at risk of problematic consumption of alcohol.

Keywords:

Alcohol abuse; Psychopathy; Reinforcement Sensitivity Theory; Personality; Risk Evaluation

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Introduction

Identifying personality traits associated with alcohol use disorders could allow for better identification of at-risk individuals and the development of more effective, individually responsive, interventions. Personality traits are the manifestation of complex biological (neurological, genetic) and social (life history, situational preferences) influences on an individual's behaviour. There is a growing literature on how studying the varying presentation of psychopathy-like personality in the general population may be used to explain a variety of problematic life behaviours (i.e. Anestis, Anestis & Preston, 2018; Christian, Sellbom & Wilkinson, 2017; Cofey, Cox & Kopin, 2018; Vieira et al., 2013). Adopting a distributed trait model of psychopathy like this, allows researchers to explain variance in particular behaviours using tools that draw on a rich background of biosocial psychological literature. The neurology (see Wahlund & Kristiansson, 2009), genetics (see Gunter, Vaughn & Philibert, 2010) and neuroendocrinology (see Glenn & Raine, 2008) of psychopathy has been studied in depth, as well as the influence of life history (Dargis, Newman & Koenigs, 2016), peer groups (Tater, Joseph, Cavanagh & Cauffman, 2016; Van Zalk & Van Zalk, 2015) and stressful life events (Eisenbarth et al., 2019) on exacerbating the presentation of psychopathic behaviours. These traits should be of particular interest for alcohol abuse researchers as the constellation of psychopathic traits includes, impulsivity and boldness, which are similar to those that have previously been related to alcohol consumption in US samples of college students (Kazemi, Flowers, Shou, Levine & Van Horn, 2014; Read & O'Connor, 2006). The principal aim of this current study is to extend the research on psychopathic personality literature in the domain of alcohol use disorders. We also draw attention to the Reinforcement Sensitivity Theory (RST) of personality which has similar properties to psychopathic personality traits, but it is not oriented around the fundamental antisocial core of psychopathy research. Thus RST might be more effective at detecting alcohol use disorders when there is not an antisocial component to the misuse. Further objectives of this study include investigating the role psychopathic personality and alcohol use disorders play in risk-taking. .

There is a long history of research into ‘psychopaths’ and how their behaviour might be problematic for themselves and those around them. Current research has moved towards considering psychopathic traits on a continuum, in line with a large number of clinical psychologists calling for dimensional diagnosis in personality disorders (see Hopwood et al., 2018). The body of psychopathic personality research largely agrees that psychopathy can be conceptualised with three main traits; callousness, impulsivity and fearlessness. However, it should be noted that specific terminology for these domains and measures used to assess them vary between researchers (Drislane, Patrick & Arsal, 2014; Patrick, Fowles & Krueger, 2009). Patrick et al.’s (2009) Triarchic theory of psychopathy to labels these three traits, Meanness (lack of empathy, callousness), Disinhibition (lack of self-control, impulsivity) and Boldness (tolerance for danger, fearlessness, low-anxiety). The triarchic dimensions of psychopathy have been shown to be important for understanding mental health issues termed ‘internalizing’ or ‘neurotic’ symptomology. This includes how social anxiety and general depression correlate positively with Disinhibition and negatively with Boldness (Latzman et al., 2018). High Boldness is protective to mental health issues as these individuals show ‘emotional detachment’ (Patrick et al., 2009), which is due, in part, to atypical neurological functioning (see Glenn & Raine, 2008). As internalising disorders are known to be comorbid with alcohol abuse (e.g. Anker et al., 2017), it could be the case that the neurologically-based emotional disconnection found in psychopathic Boldness is a protective factor against alcohol abuse. There is also a relationship between high psychopathic Disinhibition and internalising disorders. This could be due to the life dissatisfaction that comes with adult dispositional impulsive behaviour (see Oerback et al., 2019) as one struggles to function adult life where high self-control is required. Through anxiety, Disinhibition could also explain alcohol use disorders. However, Disinhibition has additive risk for alcohol use disorders, beyond the anxiety pathway, as the neurology of low self-control (particularly the anterior cingulate and middle frontal gyrus) has been implicated in the development of substance use (see Holmes, Hollinshead, Roffman, Smoller & Buckner, 2016). Therefore, from the biosocial literature, we could predict that Boldness (negatively) and Disinhibition (positively) would predict alcohol use disorders.

Previous research has studied these hypothesised relationships between alcohol abuse and psychopathic traits. Hemphill, Hart and Hare (1994) found that clinical psychopathy was related to younger first age of alcohol intoxication across four forensic population studies. Similarly, US college students scoring higher on psychopathic-impulsive traits are more likely to engage in heavy episodic drinking (Sylvers, Landfield & Lilienfeld, 2011). On the other hand, other work has found no direct link between impulsivity and alcohol abuse in clinical populations (Whiteside & Lynam, 2009). Much of the evidence investigating the relationship between psychopathic traits and alcohol consumption is typically targeted within alcohol abusing or criminal offending populations (see Walsh, 1999; Windle & Dumenci, 1999) and does not look to the general population. When researchers use non-forensic samples, their work typically focuses on student drinking behaviour, finding evidence of psychopathic personality traits, such as impulsivity (Baer, 2002) and anti-psychopathic traits, such as neuroticism (Ham & Hope, 2003) correlating with binge drinking behaviour. Our current study expands on this mixed existing literature using contemporary measures of psychopathic personality traits, general impulsivity and general sensation seeking in broad adult population.

A second theory containing similar traits to psychopathy, but designed from a non-clinical perspective, is the Reinforcement Sensitivity Theory (RST, see Corr, 2016). This is a theory of personality constructed from a neurological understanding of behaviourism and how animals differently respond to positive, negative and ambiguous stimuli in the world. RST summarises general tendencies in environmental exploration and impulsivity (Behavioural ApproachSystem, 'BAS'), anxiety and hesitancy (Behavioural Inhibition System, 'BIS'), and avoidance and fearfulness (Fight/Flight/Freeze System, 'FFFS'). RST posits that individuals are differently disposed towards seeking reward, avoiding punishment and resolving perceptions of ambiguous stimuli due neurological and endocrine differences between people (for an overview, Corr, 2016). An individual more disposed to BAS behaviour is an individual who is more inclined to act towards reward in the world, be it reckless-impulsively or more future-oriented planful approach. An individual who is more likely to perceive adversity in the world is one who is more disposed towards the FFFS system. In situations where it is not clear if a stimulus is rewarding or punitive or if a stimulus is temporarily or spatially separate from the individual, then those who are more disposed to the BIS will spend more

time trying to decide how to act. When an individual takes more time to resolve their perception they engage in rumination and are in a state of anxiety. RST describes similar traits to those expressed in the triarchic model of psychopathy. Where RST describes those with strong BIS as anxious, the triarchic model considers lowly anxious people as Bold. Where the RST refers to impulsive BAS, the triarchic model has Disinhibition. However, RST is not developed from a moral perspective and only considers social relations as a secondary trait to the three primary responses of BIS, BAS and FFFS. This is in contrast to the core antisocial behaviours that drive psychopathic personality research. It may well be the case that measures designed to assess these theories might have different predictive value for alcohol use disorder due to the measurement references to antisocial behaviour. Various RST measures have been shown to correlate with the similar traits of psychopathic personality; high BAS with impulsivity, low BIS with low anxiety, and low FFFS with fearlessness (Hughes, Moore, Morris & Corr, 2012; Levenson, Kiehl & Fitzpatrick, 1995; Satchell, Bacon, Firth & Corr, 2018; Sellbom & Philips, 2013). However, contemporary RST has not been well-studied in relation to alcohol abuse (*c.f.* Comeau, Stewart & Loba, 2001; Franken, 2002; Lopez-Vergara et al., 2012) and so our current study will seek to update the literature with the latest measures of RST (Corr & Cooper, 2016). By using RST and the TriPM we can investigate the impact of differing, but similar, models of impulsivity, anxiety and fearfulness on alcohol use in general populations.

As there are known relationships between RST and risk-taking behaviour (Satchell et al., 2018) and psychopathy and risk-taking behaviour (Hosker-Field, Molnar & Book, 2016), we will also investigate if these traits affect perceptions of negative outcomes of risk-taking, particularly focusing on risk-taking behaviour pertinent to alcohol. In including this, our research can be considered alongside the existing research on alcohol use expectancies. Previous studies have investigated whether individuals foresee positive or negative outcomes from alcohol use. In US college students, it has been shown that individuals who have more positive expectancies of consuming alcohol are more likely to be impulsive (Kazemi et al., 2014) and anxious (Read & O'Connor, 2006). Similarly, positive and negative alcohol expectancies were important for the relationship between anxious traits and alcohol use in Spanish teenagers (Ibáñez et al., 2015) and adults (Mezquita at al., 2015). In our current study, we investigate the effect of perceived risk of various behaviours without an overt

positive or negative valence to the risk. Overall, we predict that: *i*) impulsivity and anxiety traits will relate to reported alcohol use (in line with Baer, 2002; Ham & Hope, 2003), *ii*) the same traits will relate to perceiving less negative outcomes from drinking (and other) risk taking behaviours.

Materials and methods

Participants. Our cessation of data collection rule required a minimum of 250 participants. This number was chosen as it reflects the sample size required for stable correlation findings (Schönbrodt & Perugini, 2013), and meets the required sample size (N = 194) to achieve adequate power (.80) to find the minimum recommended effect size of r = .20 (see Ferguson, 2009) when alpha is set at .05. With our sample size of 349, we have can detect a minimum effect size of r = .13.

Overall 500 participants clicked on the online survey link which was shared on public but due to incomplete data (our criteria for withdrawal, as stated in our consent information), 352 participants were retained for analysis. After cleaning data due to atypical responding (see below), we conduct data analysis on 349 participants. The sample were mostly Female (67%, n = 232), 27 years old (M_{Age} = 27.18, SD = 9.86, Min = 18, Max = 72), heterosexual (85%, n = 295), their home country was in the UK (65%, n = 225), and they spoke English as their first language (80%, n = 279).

The majority of participants were recruited through an opportunity sample, responding to online advertisements in exchange for an automated report on their RST personality traits. The survey was presented using the Qualtrics website. A subset of the sample were students recruited through research participant pools and received course credit in exchange for their participation (n = 42, 11.93% of sample).

Materials.

Personality measures. Participants completed two personality measures. First, the Reinforcement Sensitivity Theory Personality Questionnaire (RST-PQ; Corr & Cooper, 2016). The RST-PQ has 65 items and investigates three principal System traits; Behavioural Approach (BAS), Behavioural Inhibition (BIS), and Fight/Flight/Freeze (FFFS). A high FFFS (10 items, in the current study α = .80) disposition is related to more evasive behaviour and perceiving unfamiliar information in the environment as potentially harmful. A high BIS (23 items, α = .93) disposition is related to rumination, worry and anxiety and is based on a tendency to be indecisive (between approaching and

avoiding) towards novel stimulus in the world. In the RST-PQ, BAS has four subdomains. BAS Impulsivity (8 items, α = .76) is dispositional, non-planful approach and BAS Goal-Drive Persistence (7 items, α = .89) is a trait reflective of future-oriented reward seeking. An individual with high trait BAS Reward Interest (7 items, α = .80) is interested in new experiences and an individual with high trait BAS Reward Reactivity (10 items, α = .77) shows more responsiveness to smaller rewards. Participants respond to the RST-PQ by stating the extent to which a series of statements describe their behaviour on a four-point scale of 'Not at all' (0) to 'Highly' (3).

Participants also completed the 58-item Triarchic Psychopathy Measure (TriPM; Patrick, 2010), which reports on the three traits reflective of psychopathy, as detailed in the Introduction: Boldness (19 items, α = .86), Meanness (19 items, α = .89), and Disinhibition (20 items, α = .85). Similarly to the RST-PQ, participants respond to the TriPM by stating how 'False' (0) to 'True' (3) self-description statements are. TriPM has previously been validated as an assessment of psychopathic traits in community samples and so is suitable for our aims of assessing psychopathic personality in a general population (Sellbom & Philips, 2013; Sica, et al., 2015).

Risk appraisal measure. The Cognitive Appraisal of Risky Events (CARE; Fromme, Katz & Rivet, 1997) scale is a tool that can be used to assess participant perception of the negative consequences that may come about from certain behaviours. The 30-item scale contains various potentially risky behaviours and our participants respond to each item by how denoting how likely (1 = Not at all likely to 7 = Extremely likely) they would "experience some negative consequence (e.g. become ill, be injured, embarrassed, lose money, suffer legal consequences, fail a class or feel bad about yourself)" if they engaged in those behaviours. Although our principal interest is in perceived negative outcomes with risky alcohol consumption, there are six types of behaviour in the CARE which are worth analysing here. Participants report on the perceived negative outcomes for risky Academic (5 items, α = .84), Aggressive (9 items, α = .96), alcoholic Drinking (3 items, α = .83), Sexual (6 items, α = .87) and Sports (4 items, α = .84) behaviours.

Alcohol consumption. Alcohol use disorders were measured with the self-report AUDIT (Saunders, Aasland, Barbor, de la Fuente & Grant, 1993). This assessment asks participants about their drinking habits, frequencies, needs and consequences. According to the World Health

Organisation test manual (Babor, Higgins-Biddle, Saunders & Monteiro, 2001) individuals with a score of 8 to 15 on the AUDIT should aim to reduce their drinking (34.90% of our sample). Those who score between 16 and 19 should be provided additional support and monitoring for their drinking (7.70% of our sample). A score higher than 20 suggests that there may be serious issues with drinking behaviour (7.10% of the current sample). We note here that the AUDIT is not a medical diagnostic tool and only acts as an *indicator* of problematic alcohol consumption. Overall we had varied responses to the AUDIT (M_{AUDIT} = 8.45, *SD* = 6.42, Min = 0, Max = 30), but the majority of our sample were in the 'healthy' range for alcohol use. There were some participants with notably high AUDIT scores of 28-30. These are unexpected by the nature of the measure as well as by the standards of our population (z > 3.00) and were removed from data analysis (*n* = 3, cleaned data presented in table 1).

Procedure. Participants were presented the study on an online survey platform. After giving consent, participants first reported demographic information and then completed the RST-PQ, TriPM, CARE and AUDIT. After the measures were complete, participants were given a report on their RST personality traits and received debriefing information.

Analysis. Correlational and regression analyses were conducted using SPSS and effect size and factor analyses being conducted in R. In line with our power calculation, alpha was set at .05 for significance testing.

In line with the aims of this study, analysis will be presented in four parts. A selection of *t*, and *F* tests (with effect size measures of *d* and ω^2) will be used to describe the differences between the demographic features of our sample on the key variables.

Secondly we will investigate shared variance between the measures in the study. Principally this will be shown with a correlation matrix. We further include exploratory factor analysis which is one of the most efficient ways to demonstrate shared variance between multiple scales. With an oblique (oblimin) rotation, the similarities and covariation involved in repeated testing is accounted for (unlike correlation matrices which do not account for this).

Thirdly we use hierarchical regression in two stages to predict AUDIT scores. First, the previously unexplored RST-PQ will be used to predict the AUDIT scores. Then we will add the

psychopathic personality measures to the model, which on the basis of prior research, we expect to explain more of the variance. We will report standardised and unstandardised estimates of beta for this test, given that with the AUDIT measure has inherent diagnostic meaning (i.e., the influence of a personality trait on AUDIT score change is important to note and informative for practical use of the AUDIT).

Fourthly, we will be interested in the extent to which the personality variables predict responses to the CARE. We will again use hierarchical regressions to investigate how the trait scores predict the CARE scores per each separate domain, and then additionally, if the AUDIT has an additive predictive power for risk appraisal. We do this as the AUDIT is an effective measure of actual risk-taking behaviour and could reveal the relationship between risk appraisal and risk taking. In this context the unstandardised estimates of beta are not informative (as the CARE scale is intangible in responding) and we will report standardised beta alone.

The data for this study are all open access on the Open Science Framework (available at: https://osf.io/q5rxv/)

Results

General scale responding. Table 1 reports on the distributions of the measures used in this study. Given the antisocial nature of the measures, there is a surprisingly normal distribution of results (all Skewness< .85), albeit with unusual flat ranges for CARE-Drug (Kurtosis= -1.17, se= .26) and CARE-Aggression (Kurtosis= -1.43, se= .26, all other Kurtosis< -.85).

[Table 1 about here]

There were no notable sex differences in the CARE and AUDIT responses (largest effects for Aggressive risk evaluation and all $t \leq 1.15$, $p \geq .251$, $d \leq .13$). Age only had a small effect on the AUDIT score ($r(337) = -.16$, $p = .001$) and no notable effects on CARE scales (large effects for Aggressive risk evaluation and $r \leq .10$, $p \geq .073$). There was not enough variation in sexualities or English as a first language to study these effects on CARE and AUDIT. The CARE scores did not vary across differing home countries (largest effects for Drinking CARE, all $F \leq 2.74$, $p \geq .066$, $\omega^2 \leq .001$). The AUDIT did differ however ($F(2, 343) = 11.15$, $p < .001$, $\omega^2 = .02$) and this was explained by participants outside of Europe scoring lower on the AUDIT ($n = 68$, $M_{AUDIT} = 5.43$, $SD_{AUDIT} = 4.84$)

than UK (n= 225, M_{AUDIT}= 9.27, SD_{AUDIT}= 6.16, t(138.54)= 5.36, p< .001, d= .65) and European (n = 56, M_{AUDIT}= 6.50, SD_{AUDIT}= 6.50, t(99.75)= 2.22, p= .029, d= .41) participants. There was no notable difference between the UK and European participants in AUDIT scores (t(81.37)= 1.58, p= .118, d= .24). It should be noted that none of these effects are of a moderate-large size and normal (M±SD) responses largely do not differ in WHO diagnostic categories. In summary, there were limited meaningful demographic effects on the AUDIT and no effects for the CARE.

Shared variance in measures. Table 2 presents pairwise correlations between the personality scores and the CARE and AUDIT measures. There were few notable correlations between risk appraisal and the trait measures. There was some evidence that Bold (r(349)= -.21, p< .001) and Mean (r(349)= -.20, p< .001) psychopathic traits related to perceiving less negative consequences of drug use but other risk appraisal correlations were of a small size. For the AUDIT, higher scores were found for those individuals who were more Impulsive (r(349)= .21, p< .001) and Disinhibited (r(349)= .31, p<.001) and all other correlations were small. Overall, there was no evidence that personality scores related to risk appraisal, although more psychopathic individuals saw less risk in drug use. For problematic alcohol consumption there was evidence that low self-control increased risk behaviour, as fitting with the literature, but no other effects were demonstrated.

[Table 2 about here]

One of the most efficient ways to demonstrate shared variance between multiple scales is with exploratory factor analysis. With an oblique (oblimin) rotation, the similarities and covariation involved in repeated testing is accounted for (unlike correlation matrices which do not account for this). Parallel analysis suggested 5 factors sufficiently explained the data ('fa.parallel'). A five-factor model had a satisfactory Tucker-Lewis Index (.91) and RMSEA (.07, 90% *CI* [.05, .08]). The factor loadings can be found in Table 3.

[Table 3 about here]

The first factors brings together the 'Fearfulness' scales of high RST-PQ BIS (.67), FFFS (.72) and low TriPM Boldness (-.80) and Meanness (-.34). A second, groups the BAS traits of BAS-Impulsivity (.42), BAS-Reward Reactivity (.65), BAS-Goal-Drive Persistence (.72) and BAS-Reward Interest (.63). A group of scores pertinent to classical definitions of psychopathic personality is

formed by TriPM Meanness (.49), Disinhibition (.87) and BAS-Impulsivity (.60) and this factor contained the strongest loading of the AUDIT total (.34). The CARE scales were largely separate from the trait scores, but formed two groups of Social Risk (Drinking= .98 and Sport= .45) and more Atypical Risk (Drug= .58, Academic= .67, Aggressive= .89 and Sex= .87) appraisal. These results show a general convergence between the RST-PQ and TriPM in the expected ways (fearlessness and impulsivity), the relationship between the AUDIT and psychopathic personality and no principal association between the personality measures and the cognitive appraisal scales.

Predicting alcohol use. One focus of investigation in this study is the prediction of the AUDIT using the RST-PQ and the TriPM. With the extent literature relating psychopathy to drinking behaviour, it is assumed that the TriPM will explain much of the variance in AUDIT scores. We produce two-step regression models, where Model 1 contains the RST-PQ alone and then Model 2 includes the TriPM. The results of this regression can be found in Table 4.

In Model 1, problematic consumption of alcohol was associated with increased anxiety (BIS), low fear (FFFS), increased impulsivity (BAS-Impulsivity) and some evidence of more reward reactive individuals scoring higher as well. However, it should be noted that these effects were generally small (all $\beta \leq \pm .16$). In real terms a one point change on the 0-3 response scales of the RST-PQ's BIS, FFFS, BAS-Impulsivity and BAS-Reward Reactivity each related to approximately a 1.5 AUDIT score change (see unstandardised beta values in Table 4).

The introduction of psychopathic traits in Model 2 improved the percentage of variance explained, with a significant change to the model R^2. This is explained by the inclusion of TriPM Disinhibition which was the strongest predictor in the second model, and of notable size. A one point change in the (0-3 response) TriPM Disinhibition scale related to a 3.39 change in AUDIT scores. With the AUDIT total possible score being 30, this trait is having an important influence. Disinhibition absorbs most of the variance in Model 2, however the RST-PQ BIS (anxiety) is still a significant predictor (see Table 4).

[Table 4 about here]

In line with the previous literature, our results show that disinhibited and anxious personalities are more likely to problematic alcohol consumption.

Predicting evaluations of risk. Participants who perceived more negative outcomes from risky drinking behaviour reported more negative outcomes from risky Drug ($r(349) = .35$, $p < .001$), Academic ($r(349) = .21$, $p < .001$), Sex ($r(349) = .26$, $p < .001$) and Sports ($r(349) = .41$, $p < .001$) behaviour. Perceived negative outcomes to risky drinking behaviour did not relate to negative outcomes of risky Aggressive behaviour ($r(349) = .01$, $p = .811$).

In general, our hierarchical regression models of personality scores predicting CARE scores were not powerful explanations of variance (all $R^2 \leq .09$, see Table 5). Even with the inclusion of AUDIT scores, as a proxy measure of actual risk taking, no model explained more than 9% of the variance in risk appraisal. Detailed reports on the model can be found in Table 5.

Our main interest was in factors affecting the evaluation of negative consequences from risky Drinking behaviour. Model 1 was not sufficient to explain variance in Drinking CARE, however Model 2 was an improvement, explaining 6% of the variance. The AUDIT was a reasonable positive predictor of perceived Drinking risk, suggesting those with problematic alcohol consumption seeing more risks with drinking.

In the other models only one or two predictors were statistically significant and these varied across the risk-taking domain. In brief, for Sports, Academic, Drug and Aggressive risk taking the perception of harm was best predicted in Model 1, and the addition of the AUDIT did not improve the explanation of variance in the Model 2. Varying personality measures were the best predictors across the models, such as increased anxiety (Sport), decreased fearfulness (Academic) and increased psychopathic boldness (Drug and Aggressive). No model adequately predicted variation in perceived negative consequences of risky Sex behaviour.

[Table 5 about here]

Discussion

The results of the current study are in line with the existing literature. We find evidence that impulsivity and anxiety traits relate to problematic consumption of alcohol, much like the reviews of Baer (2002) and Ham and Hope (2003) respectively. This confirms our first prediction, but our second prediction, that we would see similar patterns with the perceived negative consequences of risky drinking was not supported. Instead we found that problematic alcohol consumption was related to

anticipating more negative outcomes, perhaps due to having experienced more negative consequences to their drinking previously. Looking to the wider literature, there is evidence that suggests that the highest consumers of alcohol do see more negative consequences of drinking, but see these outcomes are less important than the potential positive consequences (Johnson, Albery, Frings, & Moss, 2018; Patrick & Maggs, 2008). Our current study did not investigate perceived positive or negative outcomes like much of the alcohol use expectancies literature (Ibáñez et al., 2015; Kazemi et al., 2014; Read & O'Connor, 2006; Mezquita at al., 2015). Future work could focus more on the importance of psychopathic and RST traits in positive and negative alcohol use expetancies.

In general, it is important for further research, like ours, to consider studying the disposition and alcohol consumption of the general population. There are benefits to studying the traits in those who are diagnosable with clinical levels of substance abuse (i.e. Whiteside & Lynam, 2009) as it could help give information on those at-risk of serious medical problems. There are limits to applying clinical sample findings to the general population, as it is possible that high-level addiction changes personality. Therefore general population assessment of problematic drinking could give clearer signs of traits that put individual at risk of engaging in alcohol abuse (e.g. Baer, 2002; Ham & Hope, 2003; Sylvers, Landfield & Lilienfeld, 2011).

The current study draws particular attention to impulsivity and disinhibition as risk factors for problematic alcohol use. An advantage to an individual differences approach to this research allows more consideration of idiosyncratic intervention programmes. Our disinhibition findings are in line with Verdejo-Garcia's (2016) review of the neuroscience of cognitive training to address substance use disorders. Verdejo-Garcia's review argues that inhibition-focused training is theoretically sound and a plausible target for intervention in substance misuse. The literature shows that interventions to train impulsivity have shown some positive effects, such as using 'cognitive control training' to reduce emotional impulsivity (Peckham & Johnson, 2018). Further, alcohol-specific 'No-Go' inhibition task training has been shown to reduce consumption in 'hazardous drinkers' (Houben, Havermans, Nederkoorn, & Jansen, 2012; Houben, Nederkoorn, Wiers & Jansen, 2011). In a meta-analysis Allom, Mullan and Hagger (2014) No-Go focused inhibition training was notably effective in improving general health outcomes as well (including alcohol use). However, other impulsivity-

focused interventions have been less successful, such as the evidence produced by a high quality inhibition training programme for 'problem drinkers' (Jones et al., 2018). In general there needs to be more research in the area of impulsivity training and alcohol use uptake and desistence. There is interesting early data on using mindfulness based training on non-clinical populations to decrease impulsivity (Salmoirago-Blotcher et al., 2019), suggesting that broad, accessible interventions to increase inhibition skills may be deliverable to the general population. Similar mindfulness programmes have been used to address problematic (but sub-clinical) snack consumption (Forman, et al., 2016).

Our study has some limitations. Principally, the anonymised online data collection may lead participants to respond in a more extreme manner to the measures than may reflect their true behaviour. Whilst this may be appear to be a generic concern, our pre-cleaning data contained unusually high AUDIT responses (including one 30/30). Future work could use the WHO recommended interview strategy of collecting AUDIT data, to address this concern. There is also a level of behavioural abstraction in the current study, where participants only report on general behaviours. Going forward, studies could be conducted *in vivo*, assessing the impulsive and anxious personality traits of individuals actively drinking in pubs, bars, etc. Alternatively, one could use implicit methods of assessing problematic alcohol use, where participants find it more challenging to mislead researchers, such as Go/No-Go tasks (Nosek & Banaji, 2001), implicit association tasks (Greenwald, McGhee & Schwartz, 1998), or newer dynamic measures such as computer mouse-tracking (Freeman & Ambady, 2010). Perhaps reports of experience (years of drinking and experiences of drinking) could further inform about the nature of participant drinking behaviour.

Overall, our results contribute to the mixed previous literature on impulsivity and alcohol use. We replicate (Baer, 2002; Ham & Hope, 2003) and expand (using contemporary tools and a broader population) previous literature. We conclude that disinhibition and anxiety are important traits for future study, but more alcohol-relevant measures of these traits may provide better explanations than the current generic measures.

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Table 1.

Distribution of measures

Measure (Range)	Scale	Mean	SD	Min	Max	Skewness	Kurtosis
RST-PQ (0-3)	BIS	1.70	0.57	0.30	2.87	-0.29	-0.60
	FFFS	1.25	0.62	0.00	3.00	0.31	-0.26
	BAS-Imp	1.39	0.60	0.13	2.88	0.21	-0.48
	BAS-RR	1.76	0.52	0.10	2.90	-0.35	-0.11
	BAS-GDP	1.91	0.69	0.00	3.00	-0.37	-0.47
	BAS-RI	1.54	0.62	0.00	3.00	-0.07	-0.52
TriPM (0-3)	Boldness	1.49	0.46	0.16	2.63	-0.31	-0.06
	Meanness	0.73	0.47	0.00	2.47	0.85	0.53
	Disinhibition	0.90	0.46	0.05	2.50	0.73	0.25
CARE (1-7)	Drug	3.15	1.49	0.75	6.00	0.08	-1.17
	Academic	4.27	1.46	1.00	7.00	-0.31	-0.66
	Aggressive	4.03	1.87	1.00	7.00	-0.14	-1.43
	Sex	4.03	1.67	1.00	7.00	-0.21	-0.85
	Drinking	4.24	1.64	1.00	7.00	-0.27	-0.71
	Sports	3.35	1.51	1.00	7.00	0.38	-0.69
AUDIT (0-30)	AUDIT	8.28	6.15	0.00	26.00	0.70	-0.12

Note. Standard error for all Skewness is se = 0.13 and for all Kurotsis is se = 0.26

Table 2.

Pearson's bivariate c*orrelations between the psychometric and risk appraisal and alcohol use measures*

		Cognitive Appraisal of Risk Events domain						AUDIT
Tool	Trait	Drinking	Sport	Sex	Academic	Drug	Aggressive	Total score
RST	BIS	.09	.07	.09	.17*	.18*	.07	.12
	FFFS	.00	-.00	.02	-.01	.06	-.01	-.08
	BAS-Imp	.10	.17	.01	-.01	-.06	-.12	.21*
	BAS-RR	.03	.10	.02	-02	.00	-.08	.13
	BAS-GDP	-.03	.12	.04	-.11	-.04	-.03	-.09
	BAS-RI	.02	.18*	.01	-.10	-.06	-.05	.04
TriPM	Boldness	-.00	.09	-.10	-.17*	-.21*	-.15	.08
	Meanness	-.07	.10	-.09	-.08	-.20*	-.14	.15
	Disinhibition	.07	.06	-.00	.01	-.01	-.13	.31*
AUDIT	Total Score	.20*	.00	-.05	.01	-.03	-.10	-

Note. * significant at a conservative $p \leq .001$

Table 3.

Factor loadings of an exploratory factor analysis on the measures used

Tool	Trait	Fearfulness	Approach	Psychopathic	Atypical Risk	Social Risk
RST-PQ	BIS	**0.67**	0.05	0.27	0.05	0.05
	FFFS	**0.72**	0.25	-0.04	-0.08	-0.04
	BAS-Imp	0.02	**0.42**	**0.60**	-0.01	0.03
	BAS-RR	0.12	**0.65**	0.20	0.02	-0.01
	BAS-GDP	-0.03	**0.72**	-0.29	-0.01	-0.01
	BAS-RI	-0.32	**0.63**	0.06	0.03	0.02
TriPM	Boldness	**-0.80**	0.29	0.08	-0.06	0.02
	Meanness	**-0.34**	-0.12	**0.49**	-0.07	-0.07
	Disinhibition	0.04	-0.10	**0.87**	-0.01	-0.01
CARE	Drug	0.12	0.01	-0.04	**0.58**	0.25
	Academic	0.04	-0.05	0.08	**0.67**	0.10
	Aggressive	-0.03	-0.02	-0.06	**0.89**	-0.16
	Sex	-0.02	0.07	0.04	**0.87**	0.08
	Drinking	-0.01	-0.03	-0.02	0.02	**0.98**
	Sports	0.00	0.15	0.03	-0.21	**0.45**
AUDIT	AUDIT	-0.04	-0.02	**0.34**	-0.05	0.14

Note. Notable loadings (> .30) are highlighted in **bold**.

Table 4.

Linear regressions predicting AUDIT scores and categories using RST-PQ (Model 1) and additionally TriPM (Model 2) scores.

Trait	β	*B [95% CI]*	*p*
Model 1	**R^2 = 0.09, *p* <.001**		
BIS	0.14	1.49 [0.24, 2.74]	=.020
FFFS	-0.16	-1.61 [-2.77, -0.05]	=.007
BAS-Imp	0.15	1.54 [0.25, 2.83]	=.019
BAS-RR	0.13	1.53 [0.04, 3.02]	=.044
BAS-GDP	-0.12	-1.02 [-2.18, 0.13]	=.082
BAS-RI	0.00	-0.05 [-1.43, 1.34]	=.946
Model 2	**R^2 = 0.13, *p* < .001, ΔR^2 = 0.04, *p* = .001**		
BIS	0.14	1.49 [0.03, 2.94]	=.046
FFFS	-0.12	-1.17 [-2.43, 0.10]	=.070
BAS-Imp	0.01	0.06 [-1.40, 1.51]	=.941
BAS-RR	0.12	1.42 [-0.04, 2.89]	=.057
BAS-GDP	-0.07	-0.61 [-1.81, 0.59]	=.321
BAS-RI	-0.03	-0.26 [-1.64, 1.13]	=.716
Boldness	0.12	1.55 [-0.63, 3.73]	=.163
Meanness	-0.03	-0.42 [-2.00, 1.16]	=.604
Disinhibition	0.25	3.39 [1.55, 5.23]	<.001

Note. β= Standardised beta, B= unstandardized beta,

Table 5.

Standardised estimates for h*ierarchical regressions using psychometrics, and then additionally AUDIT scores, to predict appraisals of risk.*

Trait	Drinking	Sport	Sex	Academic	Drug	Aggressive
Model 1	**R^2= 0.03**	**R^2 = 0.07****	**R^2 = 0.03**	**R^2 = 0.07****	**R^2 = 0.09*****	**R^2 = 0.06***
BIS	.09	.14	.03	.13	.10	.05
FFFS	-.05	.01	-.11	-.18**	-.13	-.11
BAS-Imp	.07	.10	.03	.01	-.06	-.03
BAS-RR	.00	-.04	.02	.12	.07	-.02
BAS-GDP	-.03	.06	.07	-.08	.00	-.01
BAS-RI	-.00	.13	.04	-.02	.05	.08
Boldness	.05	.04	-.16	-.16	-.20*	-.18*
Meanness	-.14	.11	-.09	-.07	-.20**	-.07
Disinhibition	.06	-.06	.04	-.02	.08	-.10
Model 2	**R^2 = 0.06***	**R^2 = 0.07***	**R^2 = 0.00**	**R^2 = 0.07****	**R^2 = 0.09*****	**R^2 = 0.06*****
	ΔR^2 = 0.03**	**ΔR^2 = 0.00**	**ΔR^2 = 0.03**	**ΔR^2 = 0.00**	**ΔR^2 = 0.00**	**ΔR^2 = 0.00**
BIS	.06	.15*	.04	.13	.10	.06
FFFS	-.03	.00	-.11	-.19**	-.14*	-.12
BAS-Imp	.07	.10	.03	.01	-.06	-.03
BAS-RR	-.02	-.03	.03	.12	.07	-.02
BAS-GDP	-.02	.06	.07	-.08	-.00	-.02
BAS-RI	.00	.13	.03	-.02	.05	.07
Boldness	.03	.04	-.16	-.16	-.19*	-.18*
Meanness	-.13	.11	-.09	-.07	-.20***	-.07
Disinhibition	.02	-.05	.05	-.02	.09	-.09
AUDIT	.18**	-.03	-.05	-.01	-.03	-.06

Note. * $p < .05$, ** $p < .01$, *** $p < .001$