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Personality, cognition and hazardous drinking: Support for the 2-Component Approach to  
Reinforcing Substances Model.

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## Abstract

Personality and cognitive processes are both related to alcohol use and misuse. A recent model of hazardous drinking referred, the 2-CARS model, postulates two major pathways to hazardous drinking. One pathway primarily involves the association between Reward Drive and Positive Outcome Expectancies, the second involves the association between Rash Impulsiveness and Drinking Refusal Self-Efficacy. In previous tests of the model, Drinking Refusal Self-Efficacy was found to have the most proximal impact on drinking, being directly influenced by Rash Impulsiveness, and indirectly influenced by Reward Drive through Positive Outcome Expectancies. The aim of the current study was to test the 2-CARS model in a larger independent sample. Results found that individuals with a strong Reward Drive showed higher Positive Outcome Expectancies, while individuals high in Rash Impulsiveness were more likely to report reduced Drinking Refusal Self-Efficacy. The present results also showed a theoretically unexpected pathway with a direct association between Rash Impulsiveness and Positive Outcome Expectancies. However, overall the results support the view that a greater understanding of hazardous drinking can be achieved by investigating the relationship between these personality and cognitive variables.

## Personality, cognition and hazardous drinking: Further support for the 2-Component Approach to Reinforcing Substances Model.

### 1. Introduction

Impulsivity is widely regarded as playing a role in the initiation and development of hazardous drinking. Contemporary conceptualisations of impulsivity propose two biologically-based dimensions (Dawe et al., 2007; de Wit, 2009). The first, a personality factor associated with approach motivation referred to as Reward Drive (RD), is associated with a bias towards reward-related learning that creates an increased sensitivity to rewarding stimuli, including the use of psychoactive substances (Dawe, Gullo, & Loxton, 2004). The second factor, a reduced capacity to inhibit reward-related behaviors despite negative consequences, is referred to as Rash Impulsivity (RI; Dawe et al., 2004; Dawe & Loxton, 2004; Gullo & Dawe, 2008). Gullo, Dawe, Kambouropoulos, Staiger, and Jackson (2010) proposed that proximal mediators of drinking behavior were primarily cognitive although influenced by personality traits. Specifically, RD operates to influence substance misuse primarily through its effect on positive expectancies, while RI primarily influences drinking refusal self-efficacy. This model was referred to as the 2-Component Approach to Reinforcing Substances Model; 2-CARS).

Positive outcome expectancies, the beliefs people hold about the likely outcome of substance use, have been strongly associated with higher rates of alcohol use (Jones, Corbin, & Fromme, 2001), particularly in young people (Cable & Sacker, 2008). Indeed positive expectancies reported at 16 years are predictive of alcohol use and misuse in the mid-thirties (Patrick, Wray-Lake, Finlay, & Maggs, 2010). Poor drinking refusal self-efficacy, an individual's confidence in their ability to resist using a particular substance in specific situations, has also been found to predict higher levels of alcohol consumption in adolescents (Connor, George, Gullo, Kelly, & Young, 2011), college students (Young, Connor,

Ricciardelli, & Saunders, 2006), and alcohol dependent samples (Connor, Gudgeon, Young, & Saunders, 2007). Importantly, both positive expectancies and drinking refusal self-efficacy contribute unique variance to the prediction of alcohol consumption (Oei & Jardim, 2007; Young et al., 2006).

In their proposed 2-CARS model, Gullo et al (2010) argued that high levels of RD creates a bias towards perceiving and remembering the positive effects of alcohol use; thus hypothesizing a positive association between RD and positive expectancies. Rash Impulsivity, reflecting a deficit in inhibitory control, is hypothesized to be primarily associated with reduced drinking refusal self-efficacy as individuals with poor inhibitory control feel less confident in their capacity to refuse alcohol, despite potential adverse consequences. A further hypothesis of the 2-CARS model was that positive expectancies would decrease drinking refusal self-efficacy—as individuals who expect more positive effects of alcohol are less likely to refuse alcohol.

Support for the 2-CARS model has been found when tested first in a student population and dependent drinkers in treatment (Gullo et al., 2010). The relationship between RD and hazardous alcohol use was fully-mediated by positive expectancies while the relationship between RI and hazardous drinking was fully-mediated by drinking refusal self-efficacy in the clinical sample, and partially-mediated in college drinkers. The authors' concluded that specifying these pathways may help resolve an ongoing inconsistency in the relationship between impulsivity constructs and cognitive factors. However, given the limited research to date, further research evaluating the 2-CARS model is needed. The current study aimed to replicate the model presented by Gullo et al. (2010) in an independent sample.

## 2. Method

### 2.1 Participants and procedure

Data were collected from 378 undergraduate students in Brisbane, Australia who completed the measures for course credit. The majority (65.4%) were female and mean age was 20.32 years (SD = 4.45). Ethnicity was mainly Caucasian (88.1%) with 10% Asian and 8.2% 'mixed/other'. The university human research ethics committee approved the study and informed consent was obtained from each participant.

## 2.2 Measures

### 2.3 Hazardous Drinking

The Alcohol Use Disorders Identification Test (AUDIT) is a 10-item questionnaire that measures the frequency and quantity of alcohol consumption, and screens for hazardous drinking behaviours (Saunders, Aasland, Babor, De La Fuente, & Grant, 1993). The AUDIT has demonstrated excellent internal consistency (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001).

#### 2.2.2. Reward drive

The Sensitivity to Reward (SR) scale from the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (Torrubia, Ávila, Moltó, & Caseras, 2001) contains 24 items reflecting approach tendencies toward different rewards and has shown good test-retest reliability, with the SR scale demonstrating construct validity as a measure of reward drive (Dawe & Loxton, 2004).

#### 2.2.3. Rash impulsiveness

The Impulsiveness scale from Eysenck's Adult Impulsivity Questionnaire (I<sub>7</sub>; Eysenck, Pearson, Easting, & Allsopp, 1985) contains 19-items that reflect rash, unplanned behaviour (Boyle, Matthews, & Saklofske, 2008). The I<sub>7</sub> has good internal consistency and test-retest reliability (Boyle et al., 2008). The I<sub>7</sub> typically loads with other measures of rash impulsivity (Dawe & Loxton, 2004).

#### *2.2.4. Positive alcohol outcome expectancies*

The Positive Alcohol Outcome Expectancies subscale (PAOE) from Leigh and Stacy's (1993) Alcohol Outcome Expectancy Scale is comprised of 19 items describing positive effects of alcohol. The PAOE has excellent internal consistency.

#### *2.2.5. Drinking refusal self-efficacy*

The revised Drinking Refusal Self-Efficacy Questionnaire (DRSEQ-R; Oei, Hasking, & Young, 2005) contains 19 items forming three subscales: social pressure self-efficacy, emotional relief self-efficacy and opportunistic self-efficacy. Each subscale has been found to have good internal consistency (Oei, et al., 2005; Oei & Jardim, 2007). Only the total scale score was used in the current study.

### 3. Results

Cases were examined for missing values. Twenty-two participants (5.4%) of an initial sample of 402 were removed because the participant did not answer any item on at least one of the measures. Of the remaining 378 participants, a small number of items were missing on individual measures (less than 3%). These values were imputed based on the individual participants' pattern of responses to other items making up the scales.

Table 1 shows the means, standard deviations, internal reliabilities (Cronbach's  $\alpha$ ) of the measures and the zero-order correlations between scales for the whole sample. All scales showed adequate internal reliability. As expected, scores on the AUDIT correlated positively with the SR, I<sub>7</sub>, AOE Positive scales, and negatively with the DRSEQ-R.

Table 1

*Zero-order Correlations Between Measures of Impulsivity, Alcohol-related Cognitions and Negative Experiences, and Alcohol Use*

Scale	$\alpha$	M	SD	1	2	3	4
1. SR <sup>a</sup>	.78	12.00	4.31	-			
2. I <sub>7</sub> (Impulsiveness)	.81	7.31	4.23	.46	-		
3. PAOE (Total)	.95	80.07	15.09	.37	.36	-	
4. DRSEQ-R	.94	81.30	16.77	-.21	-.36	-.43	-
5. AUDIT	.80	10.05	6.70	.34	.43	.49	-.57

*Note.* All correlations significant at 0.001 level (2-tailed)

SR, Sensitivity to Reward; PAOE, Positive Alcohol Outcome Expectancies; DRSEQ-R, Drinking Refusal Self-Efficacy Questionnaire-Revised; AUDIT, Alcohol Use Disorders Identification Test.

<sup>a</sup>Item 8 “Do you like to take some drugs because the pleasure you get from them?” excluded from analyses to avoid criterion contamination

The overall model was tested using Structural Equation Model (SEM) in AMOS (version 20) with maximum likelihood estimation using the covariance matrix. Model fit was evaluated with chi-square, CFI, TLI, AGFI, RMSEA and SRMR. All constructs were modelled as single-indicator latent variables with the measurement error for each variable set to  $(1 - \text{Cronbach's } \alpha)SD^2$ ; Bollen, 1989). Mediation effects were assessed using bootstrapped bias-corrected 95% confidence intervals (MacKinnon, et al., 2004). These and



other potential mediation paths were tested using a nested models approach (Holmbeck, 1997).

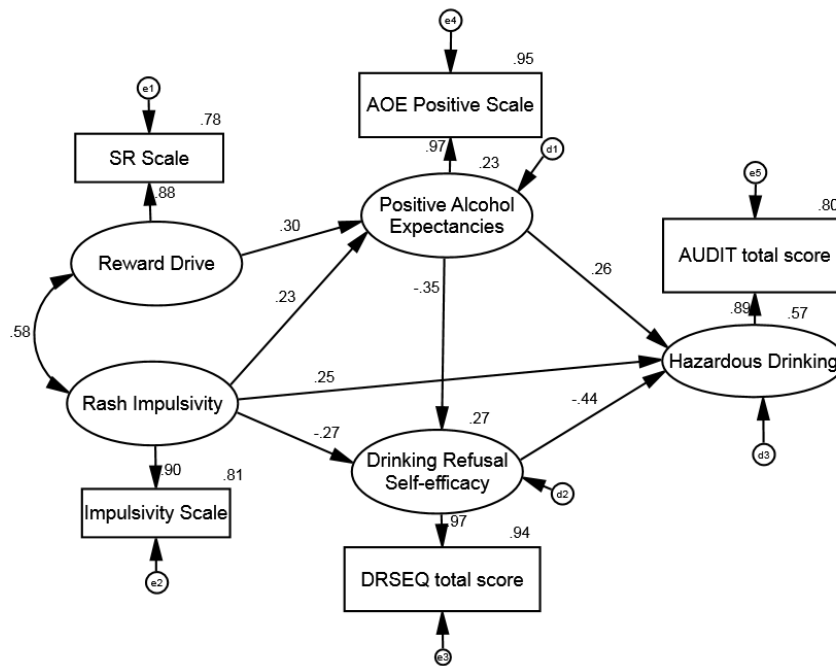


Figure 1. Final structural model of the relationship between impulsivity, alcohol-related cognition, and hazardous alcohol use. Standardised parameter estimates are presented. Estimates appearing above-right of endogenous variables indicate amount of variance explained ( $R^2$ ). All estimates are statistically significant at  $p < .05$ .

Note: SR, Sensitivity to Reward; PAOE, Positive Alcohol Outcome Expectancies; I7, Impulsiveness scale; PAOE, Positive Alcohol Outcome Expectancies; DRSEQ-R, Drinking Refusal Self-Efficacy Questionnaire-Revised; AUDIT, Alcohol Use Disorders Identification Test.

### 3.4.1 Tests of the overall hypothesised model

The hypothesised model and standardised coefficients are shown in Figure 1. This model showed overall adequate-to-good fit,  $\chi^2(3) = 14.45$ ,  $p = 0.002$ ; CFI = .98; TLI = .92,

AGFI = .92; SRMR = .04; although RMSEA = .10 was high for this model. Overall, the hypothesised model accounted for more than 50% of the variance in hazardous drinking ( $R^2 = .55$ ).

### 3.1. Tests of mediators of reward drive

As expected, RD predicted greater positive expectancies, which in turn predicted lower drinking refusal self-efficacy. Positive expectancies also directly predicted greater hazardous drinking. The indirect effect from RD to hazardous drinking (via expectancies and self-efficacy) was significantly different from zero (unstandardised indirect effect = .31, 95% CI = .21; .42).

A nested model approach was used to evaluate potential direct paths between RD and hazardous drinking, and/or between RD and drinking refusal self-efficacy. Additional paths are suggested if freeing (i.e., adding a direct path) from RD to hazardous drinking (or drinking refusal self-efficacy) significantly improves the fit of the overall model (i.e., a significant decrease in chi-square). First we tested whether there was a direct path from RD to hazardous drinking. Adding this direct path did not significantly improve fit over the more restrictive (and parsimonious) fully-mediated model (change  $\chi^2(1) = 1.96$ ,  $p = .16$ ). Next, we tested whether RD and hazardous drinking was mediated directly via drinking refusal self-efficacy (independently of positive expectancies). Freeing this path did not significantly improve fit (change  $\chi^2(1) = 2.36$ ,  $p = .12$ ), supporting the hypothesis that positive expectancies, but not drinking refusal self-efficacy, mediates the relationship between RD and hazardous drinking. RD was not directly associated with hazardous drinking or drinking refusal self-efficacy.

### 3.2 Tests of mediators of rash impulsivity

As predicted, RI was found to have a direct, negative association with drinking refusal self-efficacy, which in turn was associated with a negative effect on hazardous drinking. As

predicted, RI was also found to have a direct positive effect on hazardous drinking. Removing the direct effect of RI on hazardous drinking resulted in a significantly worsening of fit (change  $\chi^2(1) = 19.93, p < .001$ ). As such, the direct path between RI and hazardous drinking was retained. The indirect effect of RI and hazardous drinking was significantly different from zero (unstandardised indirect effect = .19, 95% CI = .10; .30), indicating that the relationship between RI and hazardous drinking was partially mediated by drinking refusal self-efficacy. We also tested whether there was a significant direct effect between RI and positive expectancies. Although not hypothesised in the initial model, freeing the path between RI and positive alcohol expectancies significantly improved fit (change  $\chi^2(1) = 10.14, p < .001$ ). The overall fit for this modified model was found to be good across all indices of fit:  $\chi^2(3) = 4.31, p = .116$ ; CFI = .99; TLI = .98, AGFI = .97; RMSEA = .06, SRMR = .02. The indirect effect of RI and hazardous drinking via positive expectancies and drinking refusal self-efficacy was significantly different from zero (unstandardised indirect effect = .34, 95% CI = .19; .48).

#### 4. Discussion

The present study adds to a body of research investigating the relationship between impulsivity and cognitive factors involved in alcohol use and misuse. Consistent with Gullo et al., we found drinking refusal self-efficacy was a strong predictor of hazardous drinking. As in the Gullo et al.'s college sample, RI operated directly on hazardous drinking as well as indirectly via drinking refusal self-efficacy (partial mediation). RD was found to have an indirect effect on drinking refusal self-efficacy, with positive expectancies mediating the relationship between RD and drinking refusal self-efficacy. Unlike Gullo et al. (2010), but consistent with Young et al. (2006) and Kabbani and Kambouropoulos (2013), we found a direct association between positive expectancies and hazardous drinking. Given that Gullo et

al. varied in controlling for socially desirable responding, future studies are needed to examine if socially desirable responding influenced this relationship.

The present study found a significant direct effect from RI to hazardous drinking (in addition to the indirect effect via drinking refusal self-efficacy). Gullo et al. (2010) also found this association with their college sample, but not their clinical sample, suggesting drinking refusal self-efficacy may play a more specific role in hazardous drinking for those with clinically significant problems. We note that Kabbani and Kambouropoulos (2013) found a significant direct effect between RI and hazardous drinking in a community sample when accounting for indirect effects via impaired control and drinking refusal self-efficacy. However, as the mean scores for hazardous drinking were not reported, it is unclear the extent of hazardous drinking in their sample.

A finding unique to the present study is the relationship between RI and positive expectancies. While not predicted on theoretical grounds, the relationship may not be surprising—reflecting a generalised failure of people with high levels of RI to acknowledge negative consequences, resulting in a bias towards endorsing items reflecting positive outcomes. Indeed, positive and negative expectancies tend to be moderately negatively correlated (Connor et al., 2011). Such a tendency could coexist with a strong drive towards rewarding experiences. However, further research is required to determine if this is a robust association or specific to the present sample.

A limitation in the current study was the use of a cross-sectional design and a single index of global positive expectancies. Future research investigating the associations between personality vulnerability, cognitions and hazardous drinking would benefit from using specific expectancies (see Wardell, Read, Colder, & Merrill, 2012), prospective designs (see Lopez-Vergara et al., 2012; Wardell et al., 2012) and potentially older, more problematic drinkers to see if these associations still hold.

In sum, this study adds support to a model that emphasises the role of both personality and cognitive variables in the understanding of hazardous drinking. Individuals with a strong RD have been found to have a bias towards reward-related learning leading to an associated increased in positive expectancies, while individuals high in RI are more likely to report reduced drinking refusal self-efficacy.

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