Exploring the Relationships Between Self-Descriptive and Behavioural Correlates of Personality in the Drinking Behaviour of Young Adults.

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Declaration

I declare that this report does not incorporate without acknowledgement any material previously submitted for a degree in any University, College of Advanced Education, or other educational institution, and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in text.

I further declare that the ethical principles and procedures specified in the Faculty of Life and Social Sciences Human Research Ethics Committee document have been adhered to in the preparation of this report.

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Signed:

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Abstract

The purpose of the current study was to explore the personality correlates that underlie the problematic drinking patterns of young adults, by employing a multimodal approach to examine the relationship between personality and alcohol use. The sample comprised 72 Victorian university students, with 19 males and 53 females (M = 20.57 years, SD = 2.68). The current study was divided into two phases; firstly, participants completed an online questionnaire assessing personality styles, alcohol use, and psychological distress, whilst the second phase consisted of a behavioural risk-task (Balloon Analogue Risk-Task; BART). As hypothesised, whilst controlling for psychological distress; impulsivity, sensation-seeking, and reward sensitivity were significantly higher in hazardous, than non-hazardous drinkers. However, risk-taking propensity as indexed by performance on the BART did not significantly differ across drinking behaviour. Based upon the findings of Lejuez et al. (2003a), a logistical regression was performed to analyse ability of a behavioural and self-report measures to predict drinking behaviour status (i.e., hazardous versus non-hazardous). The findings demonstrated that the four personality measures correctly predicted 72% of all cases (22% better than chance alone). However, the results showed that sensation-seeking was the only significant predictor of hazardous drinking styles. Conclusions were discussed in context of future research and implications of the current study.

Exploring the Relationships Between Self-Descriptive and Behavioural Correlates of Personality in the Drinking Behaviour of Young Adults.

Recent studies have highlighted that harmful alcohol use is among the main contributors of maladaptive health and safety among young adults. Alcohol use in young adults is often associated with problems resulting from intoxication, including automobile accidents, injuries, and social problems (Heale, Stockwell, Dietze, Chikritzhs, & Catalano, 2000). Alcohol use disorders (i.e., harmful use and dependence) pose a significant threat not only to the individual, but also to their families and the larger community. Thus, health professionals seeking to understand alcohol dependence and problematic drinking behaviours must also consider the variables involved in the etiology and the maintenance of such disorders. While there are several factors associated with alcohol use, such as biological, psychological, and social factors; the current investigation will focus on the contributing role of personality. The following section will briefly review the effects of alcohol consumption on an individual.

Effects of Alcohol Consumption

Alcohol is the most commonly used drug in Australia (Heale et al., 2000). Australians have been found to consume larger quantities of alcohol in comparison to other English-speaking nations (McAllister, Moore, &

Makkai, 1991; Toumbourou et al., 2005). McAllister et al. (1991) found that 97% of Australians reported having tried alcohol by the age of 16, and 40% of these individuals drank at least once a week. More specifically, alcohol was the drug of choice for 18 to 23 year olds, and university students were shown to be among the most prevalent users of alcohol (Teesson, Hall, Lynskey, & Degenhardt, 2000). In an investigation of university drinking behaviour, Roche and Watt (2000) revealed that among the 94% of students to consume alcohol, 69% also reported hazardous (i.e., alcohol intake that causes harm in the future) or harmful (i.e., alcohol intake that was already causing harm) drinking behaviour. Despite this, 62% of students with harmful drinking styles did not believe a reduction in alcohol consumption was needed.

Alcohol use disorders are among the most serious public health problems concerning young adults. Excessive alcohol consumption has been identified to not only have a physiological affect on the current state of the individual, but may also lead to prolonged biological and psychological harm. According to the Australian Alcohol Guidelines (National Health and Medical Research Council, 2001) there was clear evidence to show that, overall, alcohol was associated with an increased risk of cancer, and that it was a cause of mouth, throat, and oesophagus cancer. Furthermore, alcohol use disorders were often accompanied by psychological pathologies, such as

anxiety and mood disorders. For example, Burns and Teesson (2002) reported that approximately one-third (37%) of Australian adults with an alcohol use disorder suffered from at least one co-morbid anxiety or affective disorder. These findings were also consistent with prior North American studies (e.g., Regier et al., 1990). Similarly, problem drinkers often reported that they consumed alcohol to self-medicate in order to relieve a dysphoric mood or reduce anxiety symptoms (Spada & Wells, 2005).

Binge drinking, defined as heavy episodic drinking (i.e., four or more standard drinks in a row for females, five of more standard drinks in a row for males; Wechsler et al., 1994) is commonly associated with university students, and has a potentially negative impact on the well-being of students. In particular, Wechsler et al. (1998) reported that the problematic social behaviours that were instigated by binge drinkers caused harm not only to themselves, but also to peers. The authors found that binge drinkers had poorer academic performance (i.e., greater absenteeism), greater interpersonal issues (i.e., arguing with friends), and increased health and safety risks (i.e., suffer injuries or engage in unsafe sex). In contrast, peers commonly reported experiencing vandalism and assaults, as well as disruption of sleep, caused by alcohol intoxicated students.

Given the association between alcohol use and deleterious social, physiological, and psychological consequences, many studies have examined the contributing factors involved in harmful drinking behaviour. Of particular interest to the current study is the relationship between alcohol use and personality, specifically; impulsivity, reward sensitivity, sensation-seeking, and risk-taking. A review of these personality traits will be conducted below.

Alcohol Use and Impulsivity

Impulsivity has been defined as the tendency to inhibit inappropriate behaviours, or act spontaneously without reflection or careful deliberation (Dawe, Gullo, & Loxton, 2004). Due to its heterogenous nature, various theoretical frameworks have been developed to assess the concept of impulsivity (see Dawe & Loxton, 2004; Whiteside & Lynam, 2001). Although various theories have employed different conceptualisations of impulsivity, research has often found a close relationship between alcohol use and the construct of impulsivity. For example, cross-sectional studies have found that higher levels of impulsivity was frequently associated with greater alcohol use and alcohol related problems (e.g., Dom, Hulstijn, & Sabbe, 2006; Grau & Ortet, 1999; Whiteside & Lynam, 2003). Furthermore, several longitudinal studies have identified that impulsiveness measured in childhood was linked to the development of alcohol use

disorders in adulthood (Cloninger, Sigvardsson, & Bohman, 1988; Barnes, Welte, Hoffman, & Dintcheff, 2005; Labouvie & McGee, 1986; Pulkkinen, Virtanen, Klinteberg, & Magnusson, 2000). Leonard and Blane (1999) explained that impulsivity could adversely affect childhood development, or eventually lead to the early development of alcohol use disorders. Reynolds, Ortengren, Richards, and de Wit (2006) suggested that impulsivity was strongly linked, both as a determinant and a consequence of alcohol use. Supporting this association are the findings of alcohol use among university students, as described below.

Research has consistently found that university students who consume alcohol at harmful levels tended to also display impulsive behaviours (e.g., Ichiyama & Kruse, 1998; Hair & Hampson, 2006; Nagoshi, 1999; Simons, Carey, & Gaher, 2004). For example, Ichiyama and Kruse examined the problematic effects of binge drinking in relation to personality characteristics. The authors concluded that frequent binge drinkers whom experienced problems from alcohol (i.e., nausea, perform poorly on assessments) tended to be impulsive in comparison to social drinkers. In support of these findings, Nagoshi revealed that impulsivity was a significant predictor of alcohol use and problems. Similarly, Simons et al. (2004) examined the factors that contributed to the development of hazardous drinking patterns. The researchers reported that impulsivity was

significantly associated with hazardous drinking regardless of frequency of use or gender. Hair and Hampson also found that impulsivity in undergraduate female students was the strongest predictor of excessive alcohol use. Table 1.1 provides a brief overview of the above studies with a summary of measures used and key findings.

In summary, it appears that impulsive individuals were more likely to consume higher amounts of alcohol and experience more problematic alcohol related behaviours (Barnes et al., 2005; Dom et al., 2006; Ichiyama & Kruse, 1998; Pulkkinen et al., 2000; Simons et al., 2004 refer to Table 1.1). Despite variability in samples and diversity in the measures of impulsivity; a clear positive relationship between impulsivity and alcohol consumption has consistently been maintained. That is, research has suggested that impulsive individuals were more likely to participate in harmful or hazardous drinking behaviours, in comparison to non-impulsive individuals. Therefore, impulsiveness appears to be central to the understanding of alcohol use in young adults, as well as a predictor of problematic drinking behaviours.

Table 1.1

Studies Examining the Association Between Impulsivity and Alcohol Consumption.

Author	Study Focus	Sample	Measure of Alcohol Use	Measure of Impulsivity	Study Conclusions
Dom et al. (2006)	Examined the differences in personality characteristics across two alcoholic subgroups (Belgium).	62 early onset alcoholics (EOA) and 68 late onset alcoholics (LAO) inpatients. A cut off point of 25 years was used.	Clinical interview.	BIS (Patton et al., 1995).	EOAs presented with greater symptom severity and higher alcohol related problems than LOAs. Also, EOAs had higher levels of impulsivity and aggression relative to the LOAs. The differences in impulsivity remained after controlling for the effect of aggressiveness.
Grau & Ortet (1999)	Examined the relationship between personality and alcohol consumption in a non-clinical sample (Spain).	149 non-alcoholic women.	Self-report: health habits questionnaire developed by authors. Measured frequency and quantity of use.	KSP (Schalling, 1986; Spanish Version).	Impulsivity, sensation-seeking, low socialisation (psychopathy) and psychoticism were significantly related to both frequency and quantity of alcohol use. In addition, sensation-seeking combined with impulsivity were the strongest predictors of alcohol consumption. These characteristics define the disinhibited/antisocial personality profile, which has been repeatedly associated with alcohol use and abuse.
Whiteside & Lynam (2003)	Examined a four factor structure of impulsive behaviour in relation to alcohol abuse (USA).	60 clinically diagnosed participants recruited from treatment centres. 33 were classified as alcohol abusers.	AUDIT (Saunders et al., 1993).	UPPS Impulsive Behaviour Scale (Whiteside & Lynam, 2001).	Findings indicated that alcohol abusers with antisocial personality disorder had significant elevations on all components of the UPPS impulsivity scales. In comparison, alcohol abusers and controls differed only in impulse control.
Cloninger et al. (1988)	A longitudinal study that examined the role of heritable personality traits in alcohol abuse (Sweden).	431 Swedish participants, assessed at age 11 years (by teachers) and again at age 27 years.	Interview.	TPQ (Cloninger, 1988).	Results showed that children assessed at age 11 who were thought to be high in novelty seeking were at elevated risk to develop early-onset alcohol abuse by age 27.
Barnes et al. (2005)	A longitudinal study that examined the predictors of alcohol misuse, substance use and gambling among adolescents (USA).	522 participants assessed yearly at mean ages of 14 to 20 years.	Self-report: frequency and quantity of use.	Psychopathic State Inventory (Haertzen, et al., 1980).	Impulsivity was a significant predictor of lifetime alcohol misuse for females and delinquency for males. After controlling for gender, race and SES, impulsivity remained a significant predictor of alcohol use.
Labouvie & McGee (1986)	A longitudinal study that examined the relationship between personality and alcohol, cigarettes, marijuana, and cocaine use (USA).	882 adolescents were initially observed at ages of 12, 15 and 18. Follow up assessments were made three years after.	Self-report: frequency and quantity of use.	Shortened version of the Personality Research Form (Jackson, 1968).	Results showed that variables associated with greater drug use included lower scores on Achievement and Cognitive Structure and higher scores on Affiliation, Autonomy, Exhibition, and Impulsivity.

Note. BIS: Barratt Impulsiveness Scale; AUDIT: Alcohol Use Disorders Identification Test; KSP: Karolinska Scales of Personality; TPQ: Tridimensional Personality Questionnaire.

Table 1.1 *Studies Examining the Association Between Impulsivity and Alcohol Consumption (continued).*

Author	Study Focus	Sample	Measure of Alcohol Use	Measure of Impulsivity	Study Conclusions
Pulkkinen et al. (2000)	A longitudinal study that examined the association between personality traits, alcohol use and criminal behaviour across two countries (Europe).	437 Participants, 268 Finnish and 169 Swedish criminals and non-criminals. Assessed at ages 8, 13 years (by teachers) and again at 27 years.	Interview: frequency and quantity of use.	KSP (Schalling, 1986).	Results indicated that male offenders with alcohol related problems (Finnish and Swedish) had significantly higher scores of impulsivity in adulthood in comparison to other subgroups.
Ichiyama & Kruse (1998)	Examined the prevalence of alcohol related problems in binge drinking in relation to social contexts of drinking and personality (USA).	334 first year university students.	Self-report: binge drinking, frequency and quantity of use.	TPQ (Patton et al., 1995).	Frequent binge drinkers reported more alcohol-related problems, impulsivity and thrill-seeking tendencies than non-binge drinkers. Frequent binge drinkers were also more likely to drink in more high-risk situations, and showed stronger tendencies toward disinhibition.
Hair & Hampson (2006)	Examined the role of impulsivity and the Five Factor Model (FFM) of personality as predictors of academic performance and alcohol consumption (Britain).	236 female undergraduate university students.	Self-report: 10 item questionnaire developed by the authors measuring frequency and quantity of use.	BIS (Patton et al., 1995).	The findings showed that impulsivity was a significant predictor of both measures of academic performance and of self-reported alcohol consumption. Impulsivity was also the strongest predictor, and accounted for significant amount of additional variance.
Nagoshi (1999)	Examined the role of perceived efficacy and personality in the prediction of alcohol use and problems (USA).	142 university students - Moderate to Severe problems with alcohol.	Self-report: frequency and quantity of use	I^7 (Eysenck et al., 1987).	Perceived control measures were significantly correlated with alcohol expectancies and reasons for drinking. Alcohol use and problems were also significantly positively correlated with impulsivity.
Simons et al. (2004)	Examined the risk and vulnerability factors of alcohol-related problems (USA).	592 undergraduate university students, of which 442 were classified as alcohol users	Self-report: frequency and quantity of use. Alcohol related problems were measured with Rutgers Alcohol Problem Index.	Emotional Control Questionnaire (Roger & Najarian, 1989).	Impulsivity was significantly associated with alcohol-related problems above and beyond frequency of use and gender. In addition, there was relatively little association between impulsivity and alcohol related problems at low levels of risk but a more pronounced effect at high levels of risk.

Note. BIS: Barratt Impulsiveness Scale; KSP: Karolinska Scales of Personality; TPQ: Tridimensional Personality Questionnaire; I^7: Eysenck Impulsivity Subscale.

Alcohol Use and Sensation-Seeking

Another personality trait that has been consistently associated with alcohol use and its associated problems is sensation-seeking. Among young adults, alcohol use has been identified as a behavioural manifestation of sensation-seeking tendencies (Ratliff & Burkhart, 1984; Spotts & Shontz, 1984). Zuckerman (1994) defined sensation-seeking as the pursuit of varied, unique, and intense experiences, and the willingness to accept universal risks (e.g., physical, social, legal, and financial) for the benefit of such experiences. That is, a high sensation-seeking individual would possess a greater need to partake in different and spontaneous experiences, and would be disinhibited and easily bored.

In order to measure sensation-seeking, Zuckerman and colleagues devised a self-report questionnaire (Sensation-Seeking Scale; Zuckerman, Eysenck, & Eysenck, 1978) that assessed individual differences associated with sensation-seeking stimuli. Studies have revealed that relative to other self-report measures (i.e., the Minnesota Multiphasic Personality Inventory (MMPI), the MacAndrew Alcoholism Scale (MAC), and the Millon Alcohol Abuse Scale) sensation-seeking was the best predictor of university students' alcohol use (Andrucci, Archer, Pancoast, & Gordon, 1989; Jaffe & Archer, 1987).

Due to the multidimensional nature of sensation-seeking, Zuckerman et al. (1978) described various physical, cognitive, and social aspects that encompassed the trait. In particular, loss of inhibition (i.e., disinhibition) has frequently been associated with harmful and hazardous drinking behaviours. Behavioural disinhibition was found to be a common effect of drug abuse, with many of the biological correlates of sensation-seeking related to disinhibition (see Zuckerman, 1987, 1994, 2005). However, disinhibition alone could not be used as the sole definition of sensation-seeking, as it could not clearly define the relationship between sensation-seeking and alcohol use. Therefore, in order to understand the relationship between drinking behaviours and sensation seeking, it is important to consider all the facets associated in the trait.

Zuckerman (1994) stated that sensation-seeking was more likely to manifest in the early stages of alcohol use than in the later stages of alcohol abuse or dependence. That is, high levels of sensation-seeking were more common in the experimental or social stages of drinking, than in the stages of alcohol dependence, where the drug was needed to maintain normal mood and function. Moreover, empirical research has found that adults exhibited less sensation-seeking tendencies with age. Ball, Carroll, and Rounsaville (1994) reported that high sensation-seekers first used and abused alcohol at an earlier age than their lower scoring peers. There was

also evidence from several prospective studies to suggest that sensation-seeking observed in childhood was associated with future alcohol use disorders (e.g., Crawford, Pent, Chou, Li, & Dwyer, 2003; Horvath, Milich, Lynam, Leukefeld, & Clayton, 2004; Pedersen 1991). Furthermore, it appears that sensation-seeking was the personality trait most often associated with heavier alcohol use and misuse among university students (Beck, Thombs, Mahoney, & Finger, 1995). In particular, Yanovitzy (2006) found that sensation-seeking tendencies were directly related to alcohol use, regardless of peer pressure amongst university students. Kahler, Read, Wood, and Palfai (2003) also reported that students with high levels of sensation-seeking were more likely to consume greater amounts of alcohol. Similarly, Johnson and Cropsey (2000) demonstrated that greater sensation-seeking tendencies were correlated with increased participation in drinking games and harmful drinking behaviours.

To date only a few studies have examined the relationship between alcohol use and sensation-seeking using an Australian sample. Andrew and Cronin (1997) were the first investigators to show a positive correlation between alcohol consumption and sensation-seeking in Australian male high school students. Similarly, van Beurden, Zask, Brooks, and Dight (2005) revealed that sensation-seeking emerged as a significant predictor of harmful drinking behaviours across a large number of Australian high

school students. Furthermore, a cross-national study revealed that high levels of sensation-seeking was associated with a greater risk for alcohol use disorders in Australian and North American adolescents (Beyers, Toumbourou, Catalano, Arthur, & Hawkins, 2004). A detailed summary of these studies are provided in Table 1.2, with key measures and findings.

Although there has been a distinct link between alcohol use and sensation-seeking in young adults, it is important to note that certain studies' findings may have been confounded. The Sensation-Seeking Scale (SSS; Zuckerman et al., 1978) is known to be the most widely used measure of sensation-seeking. However, Darkes, Greenbaum, and Goldman (1998) have argued that the relationship between sensation-seeking and alcohol use has been overestimated due to the criterion contamination on the SSS. Specifically, three out of the forty items refer to alcohol use, and therefore produce criterion contamination when used to predict drinking behaviour (see Darkes et al., 1998). Furthermore, of the studies that have been mentioned, only three (Andrew & Cronin, 1997; Horvath et al., 2004; Pedersen, 1991) have reported to acknowledge this issue.

Table 1.2

Studies Examining the Association Between Sensation-Seeking and Alcohol Consumption.

Author	Study Focus	Sample	Measure of Alcohol Use	Measure of Sensation-Seeking	Study Conclusions
Andrucci et al. (1989)	Compared well validated self-report measures of alcohol use and personality across adolescents (USA).	123 high school students.	ADRS (Andrucci et al., 1989); MAC (MacAndrew, 1965).	MMPI (Starke et al., 1943); SSS (Zuckerman et al., 1978).	The study found a significant association between personality and drug use among adolescents. In particular, sensation-seeking was the strongest predictor of drug use in comparison to other self-report measures.
Jaffe & Archer (1987)	Examined the ability of well validated self-report measures to predict drug use in university students (USA).	186 undergraduate university students.	MAC (MacAndrew, 1965); Alcohol Abuse Scale (Millon, 1977).	MMPI (Starke et al., 1943); SSS (Zuckerman et al., 1978).	The results indicated a significant positive association between alcohol use and all predictors. Overall, sensation-seeking was the most powerful predictor of alcohol use.
Ball et al. (1994)	Examined the effect of sensation-seeking in substance abuse severity and psychiatric disorders of clinical patients (USA).	335 treatment seeking and community cocaine abusers.	Clinical interview.	SSS (Zuckerman et al., 1978).	The results showed that high-sensation-seekers reported greater symptom severity of substance abuse, greater psychosocial impairment, and had an earlier age of onset for substance use and abuse, than low-sensation-seekers. High-sensation seekers were also more likely to report both a lifetime history and family history of antisocial personality, attention deficit disorder, and conduct disorder.
Crawford et al. (2003)	A longitudinal study that examined the influence of sensation-seeking in the future development of substance abuse in middle school students (USA).	2208 students, 1002 Kansas City and 1206 Indianapolis. Students were initially observed at year 7, 8, and 9. Follow up assessments were made during high school.	Self-report: frequency and quantity of use.	SSS (Zuckerman et al., 1978).	The findings showed that the development of sensation-seeking tendencies in middle school predicted the development of substance use from middle school through high school. Specifically, initial levels of sensation seeking in middle school predicted both concurrent rate of alcohol use and rate of increase during high school in the Indianapolis sample. In the Kansas City sample, however, sensation seeking significantly predicted rate of increase but not initial level of use in high school.
Horvath et al. (2004)	A longitudinal study that examined the effects of sensation-seeking in the future development of substance abuse among adolescents (USA).	1002 year 9 and 10 students. Follow up assessment were made 5 years later.	Self-report: frequency and quantity of use.	SSS (Zuckerman et al., 1978).	The results indicated that higher levels of sensation-seeking during middle school were associated with high levels of alcohol abuse in adulthood (i.e., 19-21 years). The authors concluded that alcohol abuse and sensation-seeking appeared to reciprocally influence each other.

Note. ADRS: Alcohol-Drug Use Research Survey; MAC: MacAndrew Alcoholism Scale; MMPI: Minnesota Multiphasic Personality Inventory; SSS: Sensation-Seeking Scale.

Table 1.2 *Studies Examining the Association Between Sensation-Seeking and Alcohol Consumption (continued).*

Author	Study Focus	Sample	Measure of Alcohol Use	Measure of Sensation-Seeking	Study Conclusions
Pedersen (1991)	A longitudinal study that examined the impact of mental health and sensation-seeking on the drug use of adolescents (Norway).	553 students aged between 16-18 years, and were assessed over a period of 20 months.	Self-report: frequency and quantity of use.	SSS (Zuckerman et al., 1978).	The findings showed that mental health was a poor predictor of drug use. However, sensation-seeking was a strong predictor of drug use in a 20 month span. In particular, disinhibition was the strongest predictor of future drug use in both genders.
Beck et al. (1995)	Examined the effect of sensation-seeking towards alcohol use and attitudes towards drinking (USA).	811 students aged between 18-23 years, from two North American universities.	Self-report: frequency and quantity of use; SCDS (Beck et al., 1993).	SSS (Zuckerman et al., 1978).	The results revealed significant gender differences in social drinking and sensation-seeking. Specifically, both male and female high intensity drinkers were more likely to drink in a context of social facilitation and score higher on the disinhibtion subscale. Furthermore, high intensity male drinkers were more likely to drink in a context of sex seeking, whereas high intensity female drinkers tended to drink in a context of emotional pain.
Yanovitzky (2006)	Examined the influence of peer pressure across sensation-seeking and alcohol use (USA).	427 undergraduate university students.	Self-report: frequency and quantity of use.	Four item sensation-seeking measure (Hornik et al., 2001).	The results demonstrated that sensation-seeking influenced personal alcohol use both directly and indirectly. That is, higher sensation-seeking tendencies increased students' susceptibility to overt and covert pressure to use alcohol. The findings also revealed that sensation-seeking had a direct effect on alcohol use, after controlling for peer influence to use alcohol.
Kahler et al. (2003)	Examined the effect of gender, ethnicity, and sensation seeking on drinking behaviour, both directly and indirectly. The study also investigated the mediational role of social environments in which heavy drinking was common and supported (USA).	447 rural state university students, and 421 private urban university students.	Self-report: frequency and quantity of use in the past 30 days.	Zuckerman-Kuhlman Personality Questionnaire (Zuckerman et al., 1993).	The findings showed that white male sensation-seekers had the highest levels of alcohol use in both samples. There also were strong positive associations between alcohol use and fraternity/sorority involvement and peer approval of drinking.

Note. SSS: Sensation-Seeking Scale; SCDS: Social Context of Drinking Scales.

Table 1.2 *Studies Examining the Association Between Sensation-Seeking and Alcohol Consumption (continued).*

Author	Study Focus	Sample	Measure of Alcohol Use	Measure of Sensation-Seeking	Study Conclusions
Johnson and Cropsey (2000)	The current study attempted to identify associations between sensation seeking and drinking game participation (USA).	256 undergraduate university students.	Self-report: frequency, quantity of use, and drinking game participation.	SSS (Zuckerman et al., 1978).	The results revealed that sensation-seeking was associated with alcohol consumption and participation in drinking games. In particular, students with higher levels of disinhibition drank more alcohol and participated in more drinking games than students with lower disinhibition scores. Furthermore, higher levels of sensation seeking predicted greater frequency of play even after controlling for overall quantity and frequency of consumption.
Andrew & Cronin (1997)	Examined the role of sensation seeking in alcohol use among adolescent males (Australia).	298 high school male students.	Self-report: frequency and quantity of use in the past 30 days.	SSS (Zuckerman et al., 1978); Inventory of Sensation-Seeking (AISS; Arnettt, 1994).	The findings showed that sensation-seeking and alcohol use were consistent with previous research and thus extends this area to an Australian male high school sample. The results of the regression analyses indicated that the disinhibition subscale of the SSS was the strongest predictor of quantity of drinking and perceived level of drunkenness. Furthermore, the Intensity subscale of the AISS was the strongest predictor of frequency of alcohol use and binge drinking episodes. However, both subscales were significant predictors of all four alcohol consumption measures.
van Beurden et al. (2005)	Examined the impact of heavy episodic drinking (HED) on harmful behaviours associated with driving, drugs, alcohol use, and celebrations, whilst controlling for sensation-seeking tendencies (Australia).	2705 students from 40 high schools.	Self-report: frequency and quantity of use in the past month.	19-point Zuckerman Sensation Seeking Scale (Zuckerman, 1994).	The results revealed a significant association between self-reported HED and high levels of sensation-seeking. In addition, the strong association between HED and harmful behaviours (i.e., celebrating behaviours, riding with an alcohol-impaired acquaintance, and riding with a drug-impaired driver) remained after adjustments were made for sensation-seeking.
Beyers et al. (2004)	Compared the risk and protective factors that effect youth substance use in Australia and the United States.	16861 Maine (USA); 15542 Oregon (USA); and 8442 Victorian (Australia) adolescents.	Self-report: frequency and quantity of use in the past 30 days.	CTC Youth Survey (Arthur et al., 2002).	The results revealed that the risk factors most strongly related to greater alcohol and drug use in both countries were: community norms favourable toward drug use, perceived availability of drugs, poor family management, family history of substance use, friends' drug use, sensation seeking, and antisocial behaviour. Conversely, the protective factors of decreased alcohol and drug use were in both countries were: social skills and belief in the moral order.

Note. SSS: Sensation-Seeking Scale; CTC: Communities that Care.

In summary, research has consistently revealed that sensation-seeking tendencies were more prominent in the earlier stages of social alcohol use, than in the later stages of alcohol dependence. As shown in Table 1.2 (i.e., Ball et al., 1994; Crawford et al., 2003; Horvath et al., 2004; Pedersen, 1994), sensation-seeking contributed to the future development of alcohol use disorders. Table 1.2 further showed that university students were more likely to engage in hazardous drinking patterns, due to their sensation-seeking tendencies (i.e., Beck et al., 1995; Johnson & Cropsey, 2000; Kahler et al., 2003; Yanovitzy, 2006). Therefore, young adults who consume alcohol at harmful levels are more likely to exhibit high levels of sensation-seeking.

Alcohol Use and Reward Sensitivity

An individual's sensitivity to rewards may also provide an important perspective in alcohol use among young adults. Gray (1987) developed a model of personality that incorporated the approach and avoidance sensitivity of individuals towards stimuli. Gray proposed two neurologically based dimensions; the Behavioural Approach System (BAS) and the Behavioural Inhibition System (BIS), which corresponded to impulsive and anxiety related functions respectively. The BAS was related to individual variation in sensitivity to rewarding stimuli (i.e., conditioned and unconditioned), whilst the BIS was associated with individual

differences in sensitivity to learned punishment, novel stimuli, and frustrative non-reward. Collectively, these models formed the Reinforcement Sensitivity Theory (RST; Pickering & Gray, 1999). According to the RST, these two basic brain systems controlled behaviour and emotions, and were responsible for appetitive and aversive actions (Carver & White, 1994; Corr, 2004). That is, individuals more sensitive in BAS were more prone to engage in approach behaviour and consequently experience positive affect in situations that were associated with reward. Conversely, high BIS sensitive persons were more likely to withdraw and experience an increase of negative affect in situations that represented punishment. The RST was based on the assumption that individual differences in personality reflected the variation in sensitivity of the BIS and BAS.

It is commonly acknowledged that all substances of abuse have rewarding properties (i.e., euphoria, disinhibition). Thus, according to the RST, individuals with highly sensitive BAS should be more inclined to participate in alcohol and drug use. However, to date there has been limited research exploring the relationship between reward sensitivity and alcohol use (e.g., Franken, 2002; Franken & Muris, 2006; Franken, Muris, & Georgieva, 2006; Johnson, Turner, & Iwata, 2003; Loxton & Dawe, 2001). Despite this, the research thus far has demonstrated that greater alcohol use

in non-clinical populations was associated with increased BAS sensitivity. In particular, Loxtone and Dawe examined the relationship between problematic drinking behaviours and reward sensitivity. The authors proposed that young women (i.e., aged 16-18 years) with high levels of reward sensitivity would be at greater risk of problematic drinking styles. The study found that the BAS components of fun seeking and drive sensitivity were the strongest predictors of harmful drinking behaviours. Loxtone and Dawe concluded that adolescent girls who participated in harmful drinking behaviours were more to prone to pursue desired goals, and to spontaneously seek out rewarding experiences. Similarly, Fraken and Muris examined the relationship between alcohol use and BAS sensitivity in a large cohort of undergraduate students. The authors revealed that fun seeking was the only component of the BAS to positively correlate with alcohol use (i.e., frequency and binge drinking).

Investigations using clinical groups have also shown similar findings in relation to alcohol use and BAS activity. Franken (2002) compared alcohol cravings in clinical and non-clinical groups in response to alcohol provoked cues. The results indicated that strong desires and intentions to consume alcohol were significantly predicted by the drive subscale of the BAS. Contrary to the authors' previous findings, Franken et al. (2006) concluded no differences between alcoholic inpatients and controls across

BAS sensitivity components. Franken and colleagues suggested that alcohol alone could not provide the rewarding properties needed to evoke increased BAS activity in alcoholic inpatients. Furthermore, Johnsen et al. (2003) examined the lifetime prevalence of alcohol use disorders in relation to reward sensitivity. The study found that adolescents willing to seek out or spontaneously approach potentially rewarding experiences had greater likelihood of developing an alcohol use disorder, within a ten year span. In particular, the fun seeking component of the BAS scale was the only predictor of lifetime alcohol use disorder.

The studies mentioned above have utilised the BAS scales (developed by Carver & White, 1994) to assess reward sensitivity. While these findings provided useful evidence in understanding the relationship between reward sensitivity and alcohol use, criticisms were raised in regards to the development of the BAS scales. For example, researchers argued that Carver and White failed to justify how the three BAS scales were functionally related to the BAS, and why it was not operationalised as a unitary measure as Gray (1987) initially proposed (e.g., Torrubia, Avila, Molto, & Caseras, 2001; Acton, 2003). Furthermore, the fun seeking component of the BAS scales had been the most consistent facet to correlate with, and predict alcohol use. However, findings showed that fun seeking was highly correlated ($r = .67$) to Zuckerman's sensation-seeking scale (see

Rawlings & Bastian, 2002). This suggested that the BAS scales were more indicative of Zuckerman's representation of sensation-seeking; which had consistently been associated with alcohol use.

Overall, the BAS scales (Carver & White, 1994) could not provide an accurate representation of Gray's personality domains in regards to alcohol use. In response to this issue a single measure of BAS activity was developed; the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia et al., 2001). In contrast to the BAS scales, the SPSRQ provided a more specific assessment of rewarding stimuli, and accurately incorporated the measure within Gray's personality theory. However, to date only two studies have utilised the SPSRQ to assess alcohol related behaviours (Kambouropoulos & Staiger, 2004; O'Connor & Colder, 2005).

Kambouropoulos and Staiger (2004) assessed the impact of appetitive and aversive alcoholic cues on personality (i.e., reward sensitivity and anxiety). Their findings indicated that social drinkers with high levels of reward sensitivity were more likely to report greater drinking urges towards cues of reward. The authors concluded that Gray's personality domains could be useful in exploring the personality correlates of cue reactivity. Correspondingly, O'Connor and Colder (2005) examined the

role of personality (i.e., reward sensitivity) in the drinking patterns of university students. The authors concluded that reward sensitivity was associated with problematic patterns of alcohol use. Specifically, high sensitivity to rewards was associated with the increased probability of women classified in the heavy occasional drinking with impairment group. This association was also evident for their male counterparts; however, men with high levels of reward sensitivity were more likely to belong to the group of very heavy occasional drinkers with impairment. The findings demonstrated the role of reward sensitivity in distinguishing specific patterns of drinking.

In summary, research that utilised the BAS as a means to analyse alcohol use had consistently found reward sensitivity a prominent predictor of alcohol use. Thus, individuals who consumed high amounts of alcohol would be more sensitive to the rewarding properties of alcohol. Furthermore, reward sensitivity would explain why individuals participated in harmful drinking behaviours despite its negative consequences.

Alcohol Use and Risk-taking

Risk-taking is among the personality traits closely associated with alcohol use. Research has indicated that alcohol consumption increased inappropriate risk-taking strategies. Risk-taking may be defined as the

participation in behaviours that involve an opportunity for gain, as well as the potential for punishment (Lane, Cherek, Pietras, & Tcheremissine, 2004). Although risk-taking incorporates a wide range of behaviours that comprise both positive and negative dimensions; those that place an individual at risk for deleterious health or safety outcomes (e.g., sexually transmitted diseases and alcohol or drug dependence) have received particular attention in the literature. To prevent potential negative outcomes associated with risk-taking, researchers have attempted to better understand the behavioural phenomenon.

Risk-taking is a multifaceted construct and covers an extensive range of behaviours and consequences. Empirical evidence has revealed that individuals who engaged in harmful drinking styles were also more likely participate in other risk-taking activities. For example, individuals who reported problematic drinking behaviours were also more likely be involved in unsafe sexual practices (Poulson, Eppler, Satterwhite, Wuensch, & Bass, 1998; Stein et al., 2005), dangerous driving behaviours (Butters, Smart, Mann, Asbridge, & Butters, 2005), and violent and criminal activities (Ge, Donnellan, & Wenk, 2001; White, Tice, Loeber, & Stouthamer-Loeber, 2002). Although these activities could be considered distinct classes of behaviour, collectively they could also be classified as different forms of risk-taking.

In order to examine the concept of risk-taking, researchers have often relied on self-report assessments of specific behaviours. That is, individuals classified as high risk-takers reported greater participation in various risk-taking behaviours (e.g., unprotected sex, dangerous driving, sky diving; see Frantz, 2002 for a review). Although these constructs clearly overlapped with risk-taking, it remained difficult to measure the multidimensional nature of risk-taking by the assessment of certain behaviours alone. Furthermore, Lejuez et al. (2002) suggested that there were several limitations that coincided with self-report measures of risk-taking. Firstly, respondents could be reluctant to report risky behaviour because of the perceived negative consequences. In addition, some individuals could lack the insight to provide an accurate report of their own behaviour. Finally, as these measurements often rely on questions that directly inquire about the behaviour under question, such measures were considerably less useful in a prevention context when one was attempting to predict the emergence of new risk behaviours. In view of these limitations, assessments of risk-taking using behavioural methods provided a more comprehensive evaluation of risk-taking. One such method is called the Balloon Analogue Risk-Task (BART).

Balloon Analogue Risk-Task (BART)

The Balloon Analogue Risk-Task (BART; Lejuez et al., 2002) is a behavioural assessment of risk-taking propensity. Instead of relying on self-reported risk-taking behaviours; the BART provided a measure of an individual's tendency to participate in risk-taking behaviours. Specifically, Lejuez et al. reported that those who scored high on the BART were more likely to engage in various risky behaviours. Relative to other behavioural adaptations of risk-taking (e.g., Bechara Gambling Task, Wisconsin Card Sort Test) that specialised more in clinical investigations (e.g., frontal lobe damage; see Lezak et al., 2004), the BART was designed to simulate real-world, risky situations. The BART was a computer simulation that involved the inflation of a balloon; that is, greater monetary reward was associated with an increase in size of the balloon. However, at some point the balloon would explode and any reward accrued for that balloon's inflation would have been lost. Therefore, in deciding how large to inflate each balloon, respondents had to balance potential gain against potential risk of loss. Lejuez et al. stated that the main contribution of the BART was to examine the unique aspects of risk, rather than replacing existing self-report measures. Although it was difficult for an experimental task to model naturally occurring behaviours; the BART used contingencies that simulated risk situations in the natural environment to identify an overall propensity

for risk taking rather than a unique likelihood of engaging in a particular type of risk behaviour.

Previous Findings of the BART

Recent investigations involving the BART have shown that it is correlated with a range of risk-taking behaviours that include alcohol and drug use, substance abuse, cigarette smoking, gambling, theft, aggression, psychopathy, conduct disorder, and unprotected sexual intercourse (Aklin, Lejuez, Zvolensky, Kahler, & Gwadz, 2005; Crowley, Raymond, Mikulich-Gilbertson, Thompson, & Lejuez, 2006; Hunt, Hopko, Bare, Lejuez, & Robinson, 2005; Lejuez, Aklin, Zvolensky, & Pedulla, 2003b; Lejuez et al., 2002; Lejuez, Simmons, Aklin, Daughters, & Dvir, 2004). Table 1.3 below shows an overview of these studies.

Table 1.3

Studies Examining the Relationship Between the BART and Risk-Taking Behaviours.

Author	Study Focus	Sample	Measures	Study Conclusions
Aklin et al. (2005)	Examined behavioural assessments of risk-taking that could accurately identify risk-taking propensity in adolescents (USA).	51 high school students from year 9-12.	Impulsivity: I^7 (Eysenck et al., 1987) Sensation-seeking: SSS (Zuckerman et al., 1978) Risk-taking: BART (Lejuez et al., 2002) Risk-taking: BGT (Bechara et al., 1994) Self-report risk-taking: YRBSS (CDC, 2001)	The results revealed that the BART was positively associated with engagement in number of substance use risk behaviours and delinquency/safety risk behaviours above and beyond demographics and self-report measures of risk-related constructs (i.e., impulsivity, sensation-seeking). However, the other behavioural measure of risk taking (i.e., BGT) showed no such significant relationships.
Crowley et al. (2006)	Examined the risk-taking propensity of adolescents with conduct and substance use disorders (USA).	20 adolescents diagnosed with conduct and substance use disorders and 20 control participants. All participants were aged between 14-20 years old.	Risk-taking: BART (Lejuez et al., 2002) Perception of risk: MTF (Johnson et al., 1985)	The findings showed that youths with conduct and substance use disorders had higher levels of risk-taking propensity, as measured by the BART than controls. The authors suggested that youths with serious conduct disorder could have frontal lobe abnormalities that cause them to take risks in novel situations.
Lejuez et al. (2003b)	Examined the relationship between validated self-report measures of personality and the BART on real-world risk-taking behaviours (USA).	26 high school students, aged between 13-17 years.	Risk-taking: BART (Lejuez et al., 2002) Self-report risk-taking: YRBSS (CDC, 2001) Sensation-seeking: SSS (Zuckerman et al., 1978) Impulsivity: I^7 (Eysenck et al., 1987)	The results indicated that the BART was significantly positively correlated to real-world risky behaviours (e.g., smoking, alcohol use, drug use, unprotected sex). However, the BART was not significantly associated with sensation-seeking and impulsivity. The authors concluded that the BART could be a useful addition to self-report batteries for assessing engagement in real-world risk-taking behaviours.
Lejuez et al. (2002)[1]	Examined the experimental properties of the BART. The study also explored the relationship between the BART and self-reported risk-related personality constructs and self-reported occurrence of real-world risk behaviours (USA).	86 university students.	Sensation-seeking: SSS (Zuckerman et al., 1978) Impulsivity: BIS (Patton et al., 1995) Impulsivity: I^7 (Eysenck et al., 1987) MPQ (Tellegen, 1982) Alcohol use: AUDIT (Sauders et al., 1993) Druge use (Babor et al., 1992) Gambling: SOGS (Lesieur & Blume, 1986) Gambling: GABS (Breen & Zuckerman, 1999) Single item measures: unsafe sexual practices; stealing; and seatbelt use. Risk-taking: BART (Lejuez et al., 2002)	The results revealed that the BART was significantly positively correlated to impulsivity (i.e., BIS), sensation-seeking, alcohol use, cigarette use, drug use, gambling, seatbelt use, unsafe sex, and stealing. The BART also accounted for significant variance in self-reported risk behaviours beyond that accounted for by and self-reported measures of sensation-seeking and impulsivity. The authors concluded that the BART could be used in combination with self-descriptive measures of personality to improve the assessment of real-world risk behaviours.

Note. I^7: Eysenck Impulsivity Subscale; SSS: Sensation-Seeking Scale; BART: Balloon Analogue Risk-Taski; BGT: Bechara Gambling Task; YRBSS: Youth Risk Behavior Surveillance System; MTF: Monitoring the Future High School Survey; BIS: Barratt Impulsiveness Scale; MPQ: Multidimensional Personality Questionnaire; SOGS: AUDIT: Alcohol Use Disorders Identification Test; South Oaks Gambling Screen; GABS: Gambling and Beliefs Scale.
1. Original BART study.

Table 1.3 *Studies Examining the Relationship Between the BART and Risk-Taking Behaviours (continued).*

Author	Study Focus	Sample	Measures	Study Conclusions
Lejuez et al. (2004)	Examined the relationship between the BART and risky sexual behaviour (USA).	76 adults from substance use residential treatment facilities.	Sex behaviour: HRBS-RSB (Darke et al., 1991) Impulsivity: I^7 (Eysenck et al., 1987) Self-esteem: RSES (Rosenberg, 1965) Depression: CES-D (Radloff, 1977). Risk-taking: BART (Lejuez et al., 2002)	The results revealed that the BART was related to risky sexual behaviour, above and beyond age, gender, self-esteem, and depressive symptoms. The findings also showed that in addition to the BART, only self-esteem significantly contributed to risky sexual behaviour.
Hunt et al. (2005)	Examined the construct validity of the BART in relation to individuals with psychopathic characteristics (USA).	80 university undergraduate students.	Psychopathic traits: SRP-II (Hare et al., 1989) Impulsivity: BIS (Barratt, 1985) Anxiety: BAI (Beck & Steer, 1993) Risk-taking: BART (Lejuez et al., 2002)	As predicted the results showed that risk-taking behaviour on the BART was significantly associated with the SRP-II Antisocial Behaviour factor, which assessed behavioural correlates of psychopathy. In addition, individuals with psychopathic traits were not only more risky but engaged in risky behaviours to a maladaptive (and punished) degree.
Lejuez et al. (2003a)	Examined the differences between smokers and non-smokers on a behavioural risk-taking task (i.e., BART) and self-report measures of impulsivity and sensation seeking (USA).	60 undergraduate university students.	Smoking status: self-report frequency and quantity Impulsivity: I^7 (Eysenck et al., 1987) Sensation-seeking: SSS (Zuckerman et al., 1978) Risk-taking: BART (Lejuez et al., 2002) Risk-taking: BGT (Bechara et al., 1994)	The logistic regression analysis indicated that the BART and sensation-seeking reliably differentiated between smokers and non-smokers. The authors suggested that the BART provides a promising tool for examining basic behavioural and physiological mechanisms in the development of multimodal measurement of risk-taking tendencies and risk-taking behaviours such as smoking.
Lejuez et al. (2005)	Examined the ability of the BART in identifying adolescent smoking. The impact of demographic variables and impulsivity and sensation-seeking on the BART and smoking was also examined (USA).	125 adolescents from grade 5 to year 12.	Smoking status: self-report frequency and quantity Sensation-seeking: SSS (Zuckerman et al., 1978) Impulsivity: I^7 (Eysenck et al., 1987) Risk-taking: Original and adolescent version - BART (Lejuez et al., 2002)	Consistent with previous research, the results revealed that adolescent smokers had higher levels of risk-taking propensity, impulsivity, and sensation-seeking, than adolescent non-smokers. The findings of logistic regression indicated that the BART was significantly related to smoking group, beyond the influence of age, gender, impulsivity and sensation-seeking.
Hopko et al. (2006)	Assessed the construct validity of the BART by examining MDMA (i.e., ecstasy) use (USA).	76 adults aged between 21-58 years.	MDMA use: self-report frequency and quantity Poly drug use: self-report frequency and quantity Impulsivity: I^7 (Eysenck et al., 1987) Risk-taking: BART (Lejuez et al., 2002)	The results showed that the BART reliably differentiated between MDMA users and MDMA non-users. Contrary to previous findings, impulsivity and sensation-seeking were not significantly related to MDMA use. As the self-report measures the BART were significantly correlated, the authors suggested that the BART could be useful in assessing the real-world risk-taking behaviours beyond the predictive validity of impulsivity and sensation-seeking measures.
Bornovalova et al. (2005)	Examined the differences in impulsivity and risk-taking propensity across crack cocaine and heroin users (USA).	16 primary crack cocaine users and 11 primary heroin users. All participants were from substance use treatment facilities.	Risk-taking: BART (Lejuez et al., 2002) Impulsivity: I^7 (Eysenck et al., 1987)	The results indicated that crack cocaine users were significantly more risk-prone and impulsive then heroin users, despite the absence of acute drug effects. The authors suggested that impulsivity may predispose individuals to perceive specific drug classes such as crack cocaine to be especially rewarding.

Note. SSS: Sensation-Seeking Scale; BIS: Barratt Impulsiveness Scale; I^7: Eysenck Impulsivity Subscale; BART: Balloon Analogue Risk-Task; HRBS-RSB: HIV Risk-taking Behavior Scale-Risky Sexual Behaviour; RSES: Rosenberg Self-Esteem Scale; CES-D; Center for Epidemiological Studies-Depression Scale; SRP-II: Self-Report Psychopathy Scale, Version 2; BIS: Barratt Impulsiveness Scale; BAI: Beck Anxiety Inventory.

Findings of Lejuez et al. (2003a)

Recent investigations have also shown that the BART was able to reliably differentiate (i.e., using logistic regression) between individuals whom participated in risk-taking behaviours and non-risk-taking behaviours. For example, studies have demonstrated that greater risk-taking propensity was associated with smoking. Lejuez et al. (2003a) examined the differences in risk-taking propensity of university smokers and non-smokers, and further compared self-report measures of sensation-seeking and impulsivity scores between the smoking groups. Lejuez et al. proposed that the combination of self-descriptive and behavioural measures of personality would provide a multimodal analysis of the personality traits involved in smoking status. The authors found that smokers had significantly greater impulsivity, sensation-seeking, and risk-taking tendencies than non-smokers. However, the logistic regression analysis revealed that only sensation-seeking and risk-taking reliably predicted the smoking behaviour of university students. The findings indicated that smokers tended to display more risky behaviour and were greater sensation-seekers compared to non-smokers. Based on these findings, Lejuez et al. concluded that the BART provided a potentially useful behavioural measure of risk-taking tendencies that differentiated smokers and non-smokers.

Consistent with the authors' previous findings, Lejuez, Aklin, Bornovalova, and Moolchan (2005) established similar results across the smoking behaviour of inner city adolescents. The authors utilised both the original and adolescent adaptation of the BART, which had a more adolescent-friendly platform (e.g., addition of cartoon graphics). Lejuez et al. (2005) stated that although respondents scored differently between the two versions of the BART (i.e., higher scores on the adolescent version of BART); smokers were still greater risk-takers than non-smokers regardless of the BART version. In addition to smoking status, the BART was also able to differentiate between ecstasy users and non-users (Hopko et al., 2006), as well as cocaine and heroin-users (Bornovalova, Daughters, Hernandez, Richards, & Lejuez, 2005). These findings suggested that the risk-taking propensity, as indexed by performance on the BART, could be useful in understanding real-world risky behaviours.

To date, no known study has utilised the BART as a measure to differentiate between hazardous and non-hazardous drinking behaviours. Given the association between alcohol use and risk-taking, and the ability of the BART to discriminate risky health behaviours, it is suggested that the BART may also be able to distinguish between problematic drinking patterns. In the original adaptation of the BART (Lejuez et al., 2002) the authors revealed a moderate positive correlation with risk-taking propensity

and alcohol use disorders. Although this finding provided important verification of the construct validity of the BART, the authors failed to analyse any group differences in hazardous and non-hazardous drinking styles.

In summary, risk-taking as indexed by performance on the BART has been shown to be significantly associated with various risk-taking behaviours. As shown in Table 1.3, behaviours that risked the health or safety of an individual had also been associated with greater risk-taking propensity as measured by the BART. Furthermore, Table 1.3 displayed that the BART had been found to reliably differentiate between risk-taking groups (i.e., Bornovalova et al., 2005; Hopko et al., 2006; Lejuez et al., 2003a; Lejuez et al., 2005). While the sample sizes of the findings mentioned were not considerably large, results revealed that a behavioural measure of risk-taking offered a different mode of analysis in personality traits. The concept of risk-taking may therefore provide valuable information in understanding the reasons underlying problematic drinking.

Research Aims

The present study investigated the personality correlates that underlie problematic drinking patterns of young adults. The primary aim of the current study was to extend upon the findings of Lejuez et al. (2003a)

with particular focus on hazardous drinking behaviours. Similar to Lejuez and colleagues' research, the present study intended to combine self-report (i.e., impulsivity, sensation-seeking) and a behavioural measure of personality to predict drinking behaviour. A multimodal approach was used to provide a more comprehensive examination of the behavioural nature of alcohol use. Furthermore, as no known studies, to date, have utilised the Balloon Analogue Risk-Task (BART) to differentiate drinking behaviour among young adults, the current study assessed the suitability of the BART as a measure for identifying hazardous drinking behaviour of university students.

Previous research has shown that rewarding aspects of alcohol were among the causal motives for individuals participating in hazardous drinking styles. Thus far, only a limited number of studies have investigated the role of the BAS (i.e., reward sensitivity) in relation to problematic drinking behaviours. Hence this study will aim at expanding upon the literature of Gray's (1987) personality domain (i.e., Behavioural Activation System; BAS).

Furthermore, as alcohol use had often been associated with anxiety and affective disorders (see Burns and Teesson, 2002; Spada & Wells, 2005), the current study intended to control for the effects of psychological

distress. In order to accurately assess the relationship between personality and alcohol use, the study adjusted for the effects of psychological distress.

Hypotheses

It was hypothesised that hazardous drinkers would report greater levels of impulsivity, sensation-seeking, reward sensitivity, and risk-taking tendencies than non-hazardous drinkers, whilst controlling for psychological distress.

Extending upon Lejuez et al. (2003a) research, it was hypothesised that the combination of a behavioural (i.e., BART) and self-descriptive measures (i.e., impulsivity, sensation-seeking) of personality would reliably differentiate between the drinking behaviour status (hazardous drinkers versus non-hazardous drinkers) among university students. It was also expected that the addition of reward sensitivity would improve the ability of the model to predict drinking behaviour status.

Method

Participants

The sample comprised 72 Victorian university students, with 19 males and 53 females. The ages of the participants ranged from 19 to 25 years (M = 20.57 years, SD = 2.68). Of the 72 participants, 55 were completing a tertiary education, 11 had completed an undergraduate or postgraduate degree, and six had a trade qualification or TAFE diploma. In terms of student ethnicity, there were 60 Australians, four Asians, three Middle-Eastern, and five Europeans. Regarding the drinking characteristics of the respondents, by frequency, 10% reported to never have consumed alcohol, 21% reported drinking on a monthly basis or less, 29% reported drinking two to four times a month, 30.6% reported drinking two to three times a week, and 10% reported to drinking four or more times a week. By quantity, 28% participants reported drinking one or two standard drinks on each occasion, 35 % reported drinking three or four standard drinks on each occasion, 19% reported to drinking five or six standard drinks on each occasion, 9% reported to drinking seven to nine drinks on each occasion, and 9% reported to drinking 10 or more standard drinks on each occasion.

Measures

Participants completed a series of questionnaires designed to measure personality traits (i.e., impulsivity, sensation seeking, and sensitivity to reward), alcohol use disorders, and emotional well-being (i.e., depression, anxiety, and stress); as well as a computerised risk-taking task. Demographics, including age, sex, ethnicity, and educational status were also collected. See Appendix A for a copy of the questionnaire.

Alcohol Use Disorders Identification Test. The Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, De La Fuente, & Grant, 1993) was a 10 item questionnaire designed to screen participants for evidence of hazardous or harmful alcohol use. The AUDIT covered domains of alcohol consumption (e.g., How often do you have a drink containing alcohol?), dependence (e.g., How often during the last year have you found it that you were not able to stop drinking once you had started?), and problems associated with alcohol consumption (e.g., How often during the last year have you had a feeling of guilt or remorse after drinking?). The AUDIT had a possible range of 0-40, with each question weighting from 0-4. A score of eight or above was suggestive of hazardous drinking behaviour. The authors reported good reliability with a Cronbach's alpha coefficient of .80 (Saunders et al., 1993).

Impulsivity Questionnaire. Impulsive behaviour was measured by the Impulsivity subscale of the Eysenck Impulsiveness Questionnaire (I_7; Eysenck, Pearson, Easting, & Allsopp, 1985). The 19 item subscale required participants to respond to either *yes* or *no* to each item (e.g., Do you often do things on the spur of the moment?). The scores ranged from 0-19; with higher scores indicative of greater levels of impulsivity. The authors reported good reliability with a Cronbach's alpha coefficient of .84 (Eysenck et al., 1985).

Sensation-Seeking Scale. In order to assess sensation-seeking, participants completed the Sensation-Seeking Scale (SSS; Zuckerman, Eysenck, & Eysenck, 1978). The scores of the 40 item measure ranged from 0-40; with higher scores indicative of higher levels of sensation-seeking. Respondents were asked to choose between a set of two opposite responses (e.g., I get bored seeing the same old faces; I like the comfortable familiarity of everyday friends). It is noted that although research has identified four distinct factors, for the purposes of the current study, the overall index of sensation-seeking was utilised. The total score had good reliability with a Chronbach's alpha coefficient of .85 (Zuckerman et al., 1978). To reduce criterion contamination, three items referring to alcohol use (i.e., Heavy drinking usually ruins a party because some people get loud and boisterous; I feel best after

taking a couple of drinks; I often get high [drinking liquor or smoking marijuana]) were removed from the data analysis.

Sensitivity to Punishment and Reward Questionnaire. The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia, Avila, Molto, & Caseras, 2001) was used to measure the individual differences in the Behavioural Inhibition System (BIS) and the Behavioural Activation System (BAS) of respondents. The purpose of using this measure was to assess reward sensitivity, and therefore only data from the 24 item sensitivity to rewards (SR) subscale was utilised. The scores from the SR subscale ranged from 0-24, with high scores indicative of higher levels of the BAS. Participants were required to respond either *yes* or *no* to each question (e.g., Do you generally give preference to those activities that imply an immediate gain?). Torrubia et al. (2001) reported good reliability with a Chronbach's alpha coefficient of .76 for the SR subscale.

Balloon Analogue Risk Task. The Balloon Analogue Risk Task (BART; Lejuez et al., 2002) was designed to measure individuals' propensity for risk-taking. This computer simulated task required participants to risk a virtual amount of money on the basis of successfully blowing up a balloon depicted on

a computer screen. At the start of the BART, the computer screen displayed three items: a small balloon on top of a balloon pump, a reset button labelled *Collect $$$*, and a *Total Earned* display. Each click on the pump inflated the balloon by a diameter of one degree (approximately .32 cm) in all directions. As participants inflated the balloon with each pump, money ($.05 per pump) was accumulated in a temporary bank. When a balloon was pumped past its individual explosion point, a 'pop' sound effect was generated by the computer, and all money in the temporary bank was lost, and the next deflated balloon appeared. At any point during each trial, the participant could stop pumping the balloon and transfer all their money from the temporary bank to the permanent bank, at which time the new total earned would be incrementally updated. A new balloon appeared after each balloon explosion or money transfer until a total of 30 balloon trials were completed.

Lejuez et al. (2002) described that the probability of a balloon exploding was fixed at 1/128 for the first pump. If the balloon did not explode after the first pump, the probability of the balloon exploding would be 1/127 on the second pump, 1/126 on the third pump, and so on, until the 128th pump at which point the probability of an explosion was 1/1 (i.e., 100%). The

participants received instructions based on the original study of Lejuez et al. but precise information about the probability of explosion was not provided.

The adjusted number of pumps across balloons was used as the primary measure, and was defined as the number of pumps on balloons that did not explode (Lejuez et al., 2002). Therefore, higher scores on the BART (i.e., greater number of adjusted pumps) indicated greater risk-taking tendency. In comparison to the original study, participants were not paid the exact amount of their earnings. Thus, in order to provide an incentive for completing the task, participants were informed that the top three money earners would receive a gift voucher.

Depression Anxiety Stress Scale. The Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995) consisted of 42 negative emotional items depicting Depression, Anxiety and Stress symptoms. Participants were required to rate the extent to which they had experienced each symptom over the past week, on a 4-point severity/frequency scale. Items for the Depression (e.g., I felt life was meaningless), Anxiety (e.g., I felt terrified), and Stress (e.g., I found myself getting agitated) scales were determined by summing the scores for the relevant 14 items. The authors reported good reliabilities with

Chronbach's alpha coefficients of .91 (Depression), .84 (Anxiety), and .90 (Stress). Similar to Crawford and Henry (2002), the current study utilised a total score of the DASS, which was an overall measure of psychological distress. Crawford and Henry reported good reliability for the total DASS score, with a Chronbach's alpha of .97. Lovibond and Lovibond provided cut-off scores ranging from normal to extreme levels of psychological distress (i.e., 0-98 normal; 99-110 mild; 111-120 moderate; 121-123 severe; 124-126 extremely severe).

Apparatus

Experimental sessions were conducted in a three metre by three metre laboratory room at the Swinburne University of Technology (SwinPsyche Labs, Applied Science Building). Participants sat at a desk with a Dell Pentium computer comprising a 15-inch colour monitor, keyboard, mouse, and speakers.

Procedure

The current study was divided into two phases. Firstly, all participants completed a series of online questionnaires that assessed respondents' personality styles, alcohol use, and psychological distress. To be eligible, participants were required to be aged 18 years or over, as this was the minimum

legal drinking age in Australia. The questionnaire took approximately 30 minutes to complete and was advertised through a psychology research recruitment program. Informed consent was acknowledged to be given upon completion of the online survey. Once respondents completed the online survey at a time and place of convenience, participants were invited to volunteer for a second phase of the study. This involved completing a behavioural risk measure (BART) in a laboratory based environment (SwinPsyche Labs, Swinburne University of Technology). Individuals who volunteered for the second phase of the project were contacted by email or telephone, advised of study procedures and scheduled for an experimental session.

At the beginning of the experimental session, participants were informed of the purposes of the study and were assured of the anonymity and confidentiality of their results. Participants were also advised that they were free to withdraw from the study at any time and asked to sign a consent form. Instructions that explained the process of the BART were then read out to the participants (see Appendix B, obtained from Lejuez et al., 2002). To facilitate a competitive environment required by the BART, participants were notified that the three highest money earners would be awarded with a shopping voucher

(1st place $100, 2nd and 3rd place $50). Upon completion of the experiment, participants who wanted to be eligible for the prize voluntarily provided their contact details and the amount of money they earned during the task and placed it into a sealed container. The experimental phase took approximately 30 minutes to complete.

Once all results were collated, the three highest earners were contacted by independent investigators and informed that their prize was to be sent to them. Each student, if applicable, received course credit for his or her involvement in the questionnaires and the experimental phases. The current study was approved by the university ethical review board. The results of the questionnaires and BART scores were collected via the Opinio Online Database and Microsoft Access 2000 software, respectively.

Results

Preliminary Analysis

All results were analysed through the SPSS statistical package, version 13. Preliminary data analyses indicated that with the exception of the AUDIT (i.e., drinking behaviour) and the DASS total (i.e., psychological distress) all measures were normally distributed. Histograms demonstrated that scores on

the AUDIT and the DASS total had severe departures from normality, and this was verified by the Shapiro-Wilks statistic.

In order to reduce skewness and to normalise the data, a square root transformation was performed on the AUDIT and DASS total. Statistical analyses (i.e., correlations, multivariate analysis of variance) were conducted to examine the differences between the transformed and untransformed data across personality measures (i.e., impulsivity, sensation-seeking, reward sensitivity, risk-taking). While the findings revealed that untransformed scores of the AUDIT and DASS total did not differ from transformed data across personality scores, it was decided to retain the original scores of both measures. In addition, the AUDIT scores in the current study were similar to Australian norms for this age group (see Teesson et al., 2000). As the present study examined a non-clinical population, it was expected that psychological distress would be positively skewed in the current sample and similar to other non-clinical studies (see Crawford & Henry, 2002).

The effects of the demographic variables were tested through a series of *t*-tests and correlational analyses. The results revealed no significant differences between gender, ethnicity and educational status across the

personality variables, AUDIT, and DASS total. As there were no differences, it was decided to collapse the demographic variables across the sample and to utilise group means.

Cronbach's alpha coefficients were calculated to assess the internal consistency of the measures used in the current study. All of the self-report scales, and the BART scores demonstrated acceptable levels of internal consistency, ranging from .77 to .92. Table 2.1 below shows the means, standard deviations, reliabilities, and theoretical range for each variable. As further shown in Table 2.1, on average, participants were categorised as hazardous drinkers by the AUDIT. Whilst BART scores were similar to that of previous research (e.g., Lejuez et al., 2003a = 37.60 pumps), participants in the current study, on average, also experienced normal levels of psychological distress as outlined by Lovibond and Lovibond (1995).

Table 2.1

Means, Standard Deviations, Reliabilities, and Range for the Variables.

Variables	*M*	*SD*	α	Theoretical Range
AUDIT[1]	8.53	6.50	.84	0-48
Impulsivity	8.92	4.05	.77	0-19
SS	20.71	5.77	.78	0-37
SR	12.11	4.72	.80	0-24
BART scores	37.53	9.84	.88	0-128
DASS total[2]	24.61	23.11	.92	0-126

Note. AUDIT: Drinking behaviour, SS: Sensation-seeking, SR: Sensitivity to rewards, BART scores (Risk-Taking): Average number of pumps on balloons that did not explode, DASS total: Psychological distress.
1. Hazardous drinking cut-off score = ≥8 (Saunders et al., 1993).
2. Psychological distress cut-off score = 0-98 normal (Lovibond & Lovibond, 1995).

Intercorrelations Among the Variables

Table 2.2 below shows the correlations between drinking behaviour (i.e., AUDIT), personality traits (i.e., impulsivity, sensation-seeking, reward sensitivity, risk-taking), and psychological distress (i.e., DASS total). The analysis revealed that drinking behaviour was significantly positively correlated to impulsivity, sensation-seeking, and reward sensitivity. Although there were no significant associations between BART scores (i.e., risk-taking) and psychological distress across drinking behaviour, the findings indicated a

positive association. Overall, greater levels of problematic drinking (i.e., high scores on the AUDIT) were associated with higher levels of impulsivity, sensation-seeking, reward sensitivity, risk-taking, and psychological distress.

Table 2.2

Intercorrelations Among the Variables.

	AUDIT	Impulsivity	SS	SR	BART scores	DASS total
AUDIT	-					
Impulsivity	.29*	-				
SS	.46**	.58**	-			
SR	.35**	.46**	.50**	-		
BART scores	.20	.30*	.30*	.21	-	
DASS total	.21	.08	-.09	.14	.00	-

Note. AUDIT: Drinking behaviour, SS: Sensation-seeking, SR: Sensitivity to rewards, BART scores (Risk-Taking): Average number of pumps on balloons that did not explode, DASS total: Psychological distress.
$N = 72$, $^{**}p < .01$, $^{*}p < .05$.

Multivariate Analysis of Covariance (MANCOVA)

A between groups MANCOVA was performed on the dependent variables (DVs) of impulsivity, sensation-seeking, reward sensitivity and risk-

taking (i.e., BART Scores), whilst adjusting for psychological distress (i.e., DASS total). The independent variable (IV) was drinking behaviour (non-hazardous drinkers and hazardous drinkers). Participants were divided into groups based on the cut-off score for hazardous drinkers (eight and above) as specified by the AUDIT (Saunders et al., 1993).

Exploratory data analysis revealed no missing values or extreme univariate or multivariate outliers at $\alpha = .001$. In addition, the assumptions of MANCOVA were satisfied (i.e., normality, homogeneity of variance-covariance matrices, linearity, and multicollinearity), and the covariate was judged to be adequately reliable for covariance analysis.

The analysis revealed that there was no significant multivariate effect between the DVs (i.e., personality traits) and the covariate (i.e., psychological distress). However, the analysis revealed a significant difference between drinking behaviour and the personality variables (*Wilks' Lambda* = .704, $F(4,66) = 1.48$, $p<.01$, *partial* $\eta^2 = .08$), indicating that non-hazardous and hazardous drinkers differed across personality traits. Table 2.3 below shows the means and standard deviations of the personality traits across drinking behaviour.

Table 2.3

Means and Standard Deviations Between Non-Hazardous and Hazardous Drinkers Across the Personality Variables.

	Non-Hazardous Drinkers $n = 36$		Hazardous Drinkers $n = 36$	
	M	*SD*	*M*	*SD*
Impulsivity	7.58	3.61	10.25	4.07
SS	17.83	4.77	23.58	5.27
SR	10.22	4.04	14.00	4.65
BART scores	35.71	10.20	39.34	9.26

Note. SS: Sensation-seeking, SR: Sensitivity to rewards, BART scores: Average number of pumps on balloons that did not explode.
$N = 72$.

Table 2.4

Tests of Covariate, Personality Variables, and Drinking Behaviour.

Effect	DV	*F*	*df*	η^2	*p*
DASS total	Impulsivity	.04	1/69	.00	.85
	SS	3.07	1/69	.04	.08
	SR	.38	1/69	.01	.54
	BART scores	.07	1/69	.00	.79
AUDIT	Impulsivity	8.07	1/69	.11	.01
	SS	26.60	1/69	.28	.00
	SR	12.25	1/69	.15	.00
	BART scores	2.53	1/69	.04	.17

Note. DASS total: Psychological Distress, AUDIT: Drinking behaviour, SS: Sensation-seeking, SR: Sensitivity to rewards, BART scores (Risk-Taking): Average number of pumps on balloons that did not explode.
$N = 72$.

As shown in Table 2.4, after controlling for the influence of psychological distress (i.e., DASS total), univariate tests revealed that there were significant differences in impulsivity, sensation-seeking, and reward-sensitivity, but not risk-taking (i.e., BART Scores). In particular, Table 2.3 showed that hazardous drinkers were found to have greater levels of impulsivity sensation-seeking, and reward sensitivity, than non-hazardous drinkers. In addition, hazardous drinkers also had higher levels of risk-taking as indexed by performance on the BART; however this difference was not significant.

Logistic Regression

A sequential logistic regression analysis was performed to predict the drinking behaviour status (non-hazardous drinkers and hazardous drinkers) of university students. Based upon Lejuez et al. (2003a) study, impulsivity, sensation-seeking, and risk-taking (i.e., BART scores) were entered as the first set of predictor variables (Model 1), and reward sensitivity was added in the second regression model (Model 2).

Although logistic regression was relatively free of restrictions (Tabachnick & Fidell, 2001), the assumptions underlying the analysis were nevertheless examined. Results of the preliminary analysis revealed that there

were sufficient ratio of cases to variables, and all observations were deemed to be independent of one another. In addition, examination of the correlations between the variables indicated non high levels of multicollinearity.

The findings revealed that there was a good model fit (discrimination among groups) on the basis of the first three predictors alone (*Omnibus Test* $\chi^2 = 21.09$, $df = 3$, $p<.01$). The addition of reward sensitivity to the model produced similar results (*Omnibus Test* $\chi^2 = 23.56$, $df = 4$, $p<.01$). These findings indicated that both set of predictors reliably distinguished between hazardous and non-hazardous drinkers. However, comparison of log-likelihood ratios revealed that the addition of reward sensitivity did not significantly add to the model ($\chi^2 = 2.47$, $df = 1$, $p = .17$). This suggested that there were no significant differences between the first set of predictors (i.e., impulsivity, sensation-seeking, risk-taking), and the inclusion of reward sensitivity to the model.

The findings showed that the first set of predictors (Model 1) accounted for 25% (Cox & Snell R^2) and 34% (Nagelkerke R^2) of the variance in drinking behaviour status. The inclusion of reward sensitivity (Model 2) accounted for 28% (Cox & Snell R^2) and 38% (Nagelkerke R^2) of the variance in the outcome.

The results also revealed that prediction success was moderately accurate. On the basis of the first three predictors, 78% of non-hazardous and 64% of hazardous drinkers were correctly predicted, for an overall success rate of 71%. This was a 21% improvement from the constant only model (i.e., without predictors) in the ability to correctly classify the respondents. The addition of reward sensitivity slightly improved the classification, with an overall success rate of 72%, while 81% of non-hazardous drinkers and 64% of hazardous drinkers were correctly classified. Table 2.5 below shows regression coefficients, Wald statistics, and odds ratios for each of the four predictors, in both models.

Table 2.5

Logistic Regression Analysis of Drinking Behaviour Status as a Function of Personality Variables.

	B	Wald Test	Odds Ratio	Model χ^2
Model 1				21.09
Impulsivity	.04	.22	1.04	
SS	.21	9.52**	1.24	
BART scores	.01	.14	1.01	
(Constant)	-5.147	10.21		
Model 2				23.56
Impulsivity	.01	.00	1.01	
SS	.19	7.24**	1.21	
BART scores	.01	.05	1.01	
SR	.11	2.38	1.11	
(Constant)	-5.55	11.21		
SS only model				20.65
SS	.23	13.81**	1.26	
(Constant)	-4.74	13.61		

Note. SS: Sensation-seeking, SR: Sensitivity to rewards, BART scores (Risk-Taking): Average number of pumps on balloons that did not explode.
$N = 72$, $^{**}p < .01$.

Table 2.5 showed that on the basis of the Wald criterion, only sensation-seeking reliably predicted drinking behaviour status across both models. The values of the coefficients revealed that higher sensation-seeking scores were associated with increased odds of hazardous drinking behaviour, by a factor of 1.24 (Model 1) and 1.21 (Model 2). Further analysis revealed that a model conducted with sensation-seeking as the only predictor, was not reliably different from the full model of predictors ($\chi^2 = 2.92$, $df = 3$; critical value of χ^2 at $p<.01 = 11.34$). This confirmed the finding that sensation-seeking was the only reliable predictor of drinking behaviour status among the four personality variables.

Overall, the results of sequential logistic regression revealed that both models reliably differentiated between hazardous and non-hazardous drinkers. However, the inclusion of reward sensitivity did not significantly add to the model, as shown by the small increase of prediction success in drinking behaviour status. The results also revealed that sensation-seeking was the only measure to significantly predict the drinking behaviour status of university students.

Discussion

Overview of Aims and Findings

The general aim of the current study was to explore the personality correlates that underlie problematic drinking behaviour of university students. In particular, the present investigation extended upon the findings of Lejuez et al. (2003a), by employing a multimodal approach (i.e., behavioural and self-descriptive measures) of personality to predict the drinking behaviour status (hazardous and non-hazardous drinkers) of university students. The present study also examined the role of Gray's (1987) personality domain (i.e., behavioural activation system; BAS) in relation to problematic drinking styles.

As hypothesised, while controlling for psychological distress, hazardous drinkers reported significantly greater levels of impulsivity, sensation-seeking, and reward sensitivity than non-hazardous drinkers. However, risk-taking propensity as indexed by performance on the Balloon Analogue Risk-Task (BART) was not significantly different between hazardous and non-hazardous drinkers. Furthermore, the results of the current study revealed that the combination of behavioural and self-report measures of personality reliably differentiated between hazardous and non-hazardous drinkers. However, sensation-seeking was the only significant

predictor of the drinking behaviour status among university students. A review of the findings in relation to the hypotheses will now be conducted.

Hypothesis 1: Differences in Personality Traits Across Drinking Behaviour

In support of the first hypothesis, the findings of the present study showed that hazardous drinkers reported higher levels of impulsivity, sensation-seeking, and reward sensitivity, than non-hazardous drinkers; while adjusting for psychological distress. The results demonstrated that psychological distress did not significantly influence the association between drinking behaviour and personality. That is, the personality traits of the respondents were primarily due to drinking behaviour, and not to the impact of psychological distress. These findings may have indicated that psychological distress was not associated with alcohol use, among the current sample of students. However, the influence of psychological distress should not be excluded in future analysis of alcohol use, as previous research has maintained a close relationship between alcohol consumption, anxiety, and mood disorders (i.e., Burns & Teesson, 2002). Therefore, in order to accurately assess the relationship between alcohol use and personality; future research should examine variables that could influence drinking behaviour. The findings of each of the personality variables in relation to drinking behaviour will be discussed below.

Impulsivity

Consistent with previous studies in the drinking behaviour of university students (i.e., Hair & Hampson, 2006; Ichiyama & Kruse, 1998; Nagoshi, 1999; Simons et al., 2004), hazardous drinkers were more impulsive than non-hazardous drinkers. These findings also coincided with past literature of impulsivity in clinical samples (i.e., Dom et al., 2006; Whiteside & Lynam, 2003). The results of the current study suggested that impulsivity may have represented behavioural characteristics that were conducive to problematic drinking behaviour. More specifically, hazardous drinkers were more likely to act spontaneously without reflection or careful deliberation, and unlikely to inhibit inappropriate behaviours, than non-hazardous drinkers. Although the construct of impulsivity had been conceptualised in different theories, the findings of the current research provided further support for the link between alcohol use and impulsivity.

Sensation-Seeking

As hypothesised, sensation-seeking was found to be greater in hazardous drinkers than non-hazardous drinkers. Congruent with earlier studies across adolescent and young adult samples (i.e., Beck, et al., 1995; Johnson & Cropsey, 2000; Kahler et al., 2003; Yanovitzky, 2006), higher levels of sensation-seeking were associated with excessive alcohol use, and greater alcohol related problems. The findings of the current study also

supported and extended upon the sensation-seeking literature in an Australian sample (i.e. Andrew & Cronin, 1997; Beyers et al., 2004; van Beurden et al., 2005). In particular, similar to van Beurden and colleagues' findings, the results of the present study revealed that problematic drinking behaviours were representative of greater sensation-seeking tendencies. Therefore, hazardous drinkers reported a heightened need to participate in different activities, and were also disinhibited and easily bored. Kambouropoulos and Staiger (2004) suggested an explanation for the strong link between sensation seeking and alcohol use, in that sensation-seekers facilitated a tendency to experience high levels of positive affect when a pleasant alcohol situation (e.g., social gatherings) was encountered.

Previous research had outlined the impact of criterion contamination in the Sensation-Seeking Scale (SSS; Zuckerman et al., 1979) when applied to alcohol use (see Darkes et al., 1995). Specifically, items that referred to alcohol use in the SSS could have overestimated the findings, when drinking behaviour was examined. Although the current study controlled for the alcohol related items, the results demonstrated that regardless of item content, the relationship between the personality trait of sensation-seeking and alcohol use was robust.

Sensitivity to Rewards

As hypothesised, the results of the study revealed that hazardous drinkers reported higher levels of reward sensitivity in comparison to non-hazardous drinkers. In line with previous research within adolescent and university samples (i.e., Loxton & Dawe, 2001; Franken & Muris, 2006), hazardous drinking behaviour was indicative of approach behaviour towards rewarding stimuli. These findings also supported the construct validity of the Sensitivity to Rewards scale (i.e., SPSRQ; Torrubia et al., 2001) in relation to alcohol use. In particular, consistent with O'Connor and Colder (2005), higher levels of sensitivity to rewards (i.e., higher scores on the sensitivity to rewards scale) was associated with problematic patterns of alcohol use. Taken together, these findings provided further support for Gray's (1987) personality domain (i.e., BAS). That is, hazardous drinkers on average had higher BAS sensitivity, and were more prone to engage in approach behaviour associated with reward. This finding could have indicated that individuals high in BAS were more susceptible to the rewarding properties associated with alcohol. This also suggested that due to the rewarding properties of alcohol, individuals were willing to consume alcohol at hazardous levels despite its negative consequences.

Risk-Taking

Contrary to expectations, the findings of current study demonstrated that there were no significant differences between the risk-taking propensity as measured by the BART, across hazardous and non-hazardous drinkers. That is, individuals who consumed alcohol at hazardous levels were no greater risk-takers than non-hazardous drinkers. Furthermore, the results revealed that there was a weak non-significant positive relationship between risk-taking propensity and drinking behaviour. This finding could have suggested that Australian university students did not perceive their drinking behaviour as a risky activity. To further support this notion, Roche and Watt (2000) found that among university students classified as hazardous drinkers, more than half did not believe a change in their alcohol consumption was needed. In addition, the results of the present study showed that on average, respondents were classified as hazardous drinkers, suggesting that university student did not perceive their alcohol consumption a problem, and thereby not a risk. These findings could therefore demonstrate that university students considered hazardous drinking behaviour as the norm, and would not have associated alcohol use with risk-taking behaviour. However, future research should examine the attitudes of participants towards drinking behaviour, to accurately understand to which degree participants believed problematic drinking behaviour to be a risky endeavour.

Hypothesis 2: Prediction of Drinking Behaviour - Comparison Between the Findings of Lejuez et al. (2003a) and the Current Study

Extending upon the research of Lejuez et al. (2003a), the combination of behavioural (i.e., BART) and self-descriptive measures (i.e., impulsivity, sensation-seeking) of personality reliably differentiated between the drinking behaviour status among university students. The results also revealed that these three personality measures were moderately accurate predictors of drinking behaviour status, correctly classifying 71% of cases (21% higher than chance alone). Contrary to expectations, the addition of reward sensitivity did not significantly improve the ability of the model to predict drinking behaviour status. Furthermore, inconsistent with the findings of Lejuez et al., sensation-seeking was the only personality trait to significantly differentiate between hazardous and non-hazardous drinkers, among the four personality measures.

As reported by Lejuez et al. (2003a), sensation-seeking and risk-taking were able to reliably differentiate among smokers and non-smokers. However, the findings of the current study revealed that sensation-seeking was the most reliable predictor of problematic drinking patterns, among university students. Therefore, in comparison to the research of Lejuez and colleagues, risk-taking propensity as measured by performance on the BART was not a behavioural correlate of hazardous drinking behaviour. This may have indicated that the BART was not a

measure of risk-taking behaviour in the current study (i.e., hazardous drinking), as also shown by the weak correlation between risk-taking and drinking behaviour. However, an alternative explanation could be that participants did not necessarily perceive problematic drinking as a risky activity. In particular, recent studies have concluded that modest alcohol consumption was associated with positive health effects on heart disease (e.g., Schroder, Marrugat, Elosua, & Covas, 2002). Similarly, a national survey reported that smoking, and not alcohol use, was the major contributor to Australian deaths annually (Australian Institute of Health & Welfare, 2003). Proodfoot and Teeson (2002) also reported that Australians between the ages of 18-35 whom engaged in harmful drinking practices did not recognise the risks of their drinking behaviour. Although there were health risks associated with alcohol consumption, it is suggested that young adults perhaps accepted these risks as customary. Overall, the acceptance of the risks associated with alcohol use could explain why BART performance did not differentiate between the drinking behaviour of young adults. That is, problematic drinking patterns did not provide an accurate delineation of a risk-taking behaviour. These findings, once again, further supported the notion that Australian university students may not have perceived hazardous drinking as a risky behaviour.

Past research has also demonstrated that the BART was able to differentiate between drug users and non-drug users (Hopko et al., 2006), and the types of drugs taken (Bornovalova et al., 2005). Conversely, Jones and Lejuez (2005) reported that risk-taking did not differ between caffeine and non-caffeine consumers. The authors stipulated that caffeine intake was not related to riskiness, as it did not share the same characteristics across other known drugs of abuse. Collectively, these findings indicated that in order for the BART to differentiate between different forms of behaviour, a clear distinction among risk-taking behaviours (e.g., smoking versus non-smokers; drug users versus non-users) had to be established. Therefore, future research in drinking behaviour should employ a more definite categorisation of groups (i.e., hazardous drinkers versus *non-drinkers*), in order to reliably differentiate between risk-taking propensities.

Further comparisons between previous research and the current findings demonstrated that on average, hazardous drinkers in the present sample performed similarly in the BART (Adjusted No. Pumps = 39), as smokers and drug users (Adjusted No. Pumps = 42 to 43: Hopko et al., 2006; Lejuez et al., 2003a). In addition, although there was a relatively weak correlation between drinking behaviour and risk-taking in the current study (r = .20); earlier studies that have found risk-taking propensity to reliably predict group status (i.e., smoking, drug use) have also shown fairly

moderate correlations (r = .27 to .28: Hopko et al.; Lejuez et al.). Based on these results, and the current sample size, risk-taking propensity should not be excluded as a principal trait in future research of problematic drinking patterns.

Sensation-Seeking

The findings of the logistic regression analysis revealed that sensation-seeking was the most important predictor of problematic drinking behaviours, among university students. In line with previous studies (see Andrucci et al., 1989; Jaffer & Archer, 1987), sensation-seeking was the strongest predictor of alcohol use, relative to other personality measures. This may have indicated that participants in the current sample were more likely to consume alcohol at hazardous levels, mainly because of their disposition to sensation-seeking experiences. In addition, Zuckerman (1994) reported that sensation-seeking was more prominent in the early stages (i.e., experimental or social drinking) of alcohol use, rather than in the later stages of alcohol abuse or dependence. In particular, drinking may have served as an outlet for sensation-seeking needs in young adults, whereas drinking in later years could have developed into a coping mechanism for feelings of anxiety and stress, along with alcohol dependence (see Zuckerman, 1987). Therefore, consistent with this notion, the current sample of young adults may have been in the early stages of

alcohol use, and thus sensation-seeking was found to be the most significant predictor among the personality variables.

Individual differences in arousal levels may have also explained the distinctive relationship between sensation-seeking and hazardous drinking behaviour. More specifically, individuals high in sensation-seeking may have searched for ways to increase their arousal levels. Although alcohol is known to be both a depressant and a stimulant, alcohol consumption has consistently been shown to increase levels of arousal (see Miller & Gold, 1991 for a review). Researchers have proposed that individuals high in sensation-seeking regularly sought to increase their arousal levels, whereas individuals low in sensation-seeking attempted to decrease their arousal levels (see Zuckerman, 1994). Supporting this notion, Neely, Lundström, and Björkvist, (2002) reported that high sensation-seekers with low levels of arousal consistently consumed alcohol to raise their levels of arousal. The results of the current study suggested that high sensation-seekers were more likely to be classified as hazardous drinkers, as a result of their need to increase their levels of arousal. That is, sensation-seeking may have influenced the current arousal states of respondents. However, due to the lack of experimental manipulations in the current study, no empirical inferences could be established.

Effects of Impulsivity and Reward Sensitivity

The results of the logistic regression revealed that a model conducted with only sensation-seeking was the most parsimonious outcome to reliably differentiate between hazardous drinking practices. While the predictors of impulsivity and reward sensitivity did not significantly predict drinking behaviour status, it is important that their impact on the regression model not be discounted. More specifically, the findings showed that impulsivity and reward sensitivity were significantly positively correlated with drinking behaviour; however, both these measures were not statistically significant (i.e., Wald coefficient) in the final regression model. This could have been due to the elevated level of multicollinearity between impulsivity, sensation-seeking, and reward sensitivity indicating that sensation-seeking could have better accounted for the variance in drinking behaviour status among the three variables. Furthermore, previous research had concluded that impulsivity and reward sensitivity, respectively, were closely associated to alcohol use. Based on these findings, and sample size, impulsivity and reward sensitivity should not be ruled out as a possible key trait in future models of problematic drinking practices.

Overall, the collaboration of behavioural and self-report measures of personality correctly classified a majority of hazardous (61%) and non-hazardous drinkers (84%). However, sensation-seeking was the most

reliable predictor of drinking behaviour status, among the four personality traits. As the first study to incorporate the BART, impulsivity, sensation-seeking and reward sensitivity in one research design, the results provided a basis for a multimodal approach in personality. While the results of the current study did not replicate the findings of Lejuez et al. (2003a) in a drinking behaviour group; a multimodal approach provided a unique perspective in the behavioural nature of alcohol use in young adults. However, it is still vital for future studies to employ a multimodal design in order to gain various insights in the broad construct of personality.

Limitations of the Present Study and Directions for Future Research

There were a number of methodological considerations in the present study that warranted discussion. As the study was a cross-sectional design, causation could not be inferred. Although the current results demonstrated a prominent association between hazardous drinking practices and sensation-seeking, it was difficult to establish the causal direction of this relationship. Future longitudinal studies could therefore address this issue and determine the direction of causality. Furthermore, the sample of the current study (i.e., university students) limited the generalisability of the findings. In particular, the results did not provide an accurate depiction of drinking behaviour in the community, and thereby would have limited

inferences between personality and alcohol use to greater heterogeneous samples.

Another limitation of the current study was the difference between the monetary incentive of the BART and monetary rewards of previous studies. While respondents originally (see Lejuez et al., 2002) received the amount they earned in the task; only the top three money earners in the current study were awarded with gift vouchers (i.e., 1st place $100, 2nd & 3rd place). Therefore, the lack of significant relationships between the BART and drinking behaviour may have resulted from the absence of immediate monetary gain. However, previous literature has shown that participants typically did not respond differently to real versus hypothetical rewards (e.g., Johnson & Bickel, 2002). Furthermore, researchers that have utilised the BART have adopted different forms of incentives to increase risk-taking propensity (e.g., movie tickets, restaurant vouchers: Bornovalova et al., 2005; Lejuez et al., 2005). Future research in risk-taking should re-examine the role of risk-taking propensity in alcohol use, by employing the BART with the original financial incentives.

Although the AUDIT (Saunders et al., 1993) was a well-validated measure of alcohol use, it was dependent on participants' recollection of past drinking experiences and thus subject to memory bias. To more

accurately identify drinking practices, researchers may have found it more informative to utilise a diary based approach. It was also difficult to distinguish specific patterns of alcohol use as the data was aggregated across average monthly use. That is, by assessing average daily quantities over a month, the assessment of binge drinking patterns would have been normalised and limited, and not accounted for heavy episodic drinking, as is common among university students. The use of a daily diary would therefore have provided a more detailed assessment of drinking patterns. A further methodological consideration was the lack of information gathered on participants' use of other substances. Alcohol use has been shown to be closely related to various drugs, particularly smoking. Therefore, the findings in the current study could have been influenced by other substances associated with alcohol consumption. However, as the present study did not control for the effects of other substances, the impact of drugs could not be examined. Therefore the inclusion of polydrug use in future studies would greatly expand the scope of assessment.

In exploring the personality correlates of drinking, future studies should examine differences in the attitudes towards alcohol use. The present study suggested that hazardous drinkers were similar in risk-taking propensity to non-hazardous drinkers. This finding coincided with past research detailing that Australian university students did not believe their

alcohol consumption was harmful. It is therefore important to examine the full range of beliefs incorporated with problematic drinking practices. Efforts should also be made to encourage those engaged in harmful drinking practices to recognise the risks of such drinking practices.

The results of the current investigation provided important information for health professionals attempting to prevent and manage hazardous drinking practices. The identification of the personality traits common in problematic drinking behaviour may further be able to help clinicians construct prevention and treatment programs that focus on these traits. The current study provided direction for future research to focus toward the impact of drinking behaviours in the real world, in order to better understand the drinking practices of young adults.

Conclusion

The primary aim of the present study was to explore the personality correlates of drinking behaviour among university students. The present study utilised a multimodal design to examine the personality traits that underlie problematic drinking patterns. The influence of psychological distress on alcohol use and personality was also examined. The results revealed that whilst controlling for psychological distress, hazardous drinkers were more likely to be impulsive, sensation-seekers, and sensitive

to rewards, than non-hazardous drinkers. This suggested that impulsivity, sensation-seeking, and reward sensitivity represented behavioural characteristics that were conducive specifically to problematic drinking patterns, and not accounted for by psychological distress. These findings further supported the relationship between personality and alcohol use.

Further analysis demonstrated that the combination of behavioural and self-descriptive measures of personality reliably predicted drinking behaviour status. Although, sensation-seeking was the only significant predictor of hazardous and non-hazardous drinking, the inclusion of the remaining variables improved the classification success of the regression model. These findings suggested that a multimodal approach provided a potentially useful technique that could be able to differentiate between hazardous and non-hazardous drinkers. Overall, these results suggested potential promise in assessment batteries using behavioural measures such as the BART, when used in combination with validated self-report measures of personality.

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Appendix A

SWINBURNE UNIVERSITY OF TECHNOLOGY

Exploring the Relationships Between Self-Descriptive and Behavioural Correlates of Personality in Hazardous Drinking Behaviour

Investigators: Alvin Noveloso
Dr. Simon Knowles (Supervisor)
Prof. Mike Kyrios (Associate Supervisor)

Research has provided evidence that risk-taking behaviours (e.g., binge drinking, gambling, drug taking) are associated with increased health related problems. Risk-taking behaviours have also shown to have a negative impact on interpersonal relationships and society as a whole. This study will explore the possible differences in the personality traits in harmful drinking behaviours. This study will involve of utilising both a questionnaire based analysis as well as behavioural measures.

In the first phase of this project you will be asked to complete an online survey. At this time, you will be required to develop a unique identification code which will then be required for the second phase of the experiment. In the second phase, you will be asked to complete a fun 20 minute virtual risk-taking and buying activity in the SwinPsych Research laboratories (3rd floor of Applied Science Building). As an extra reward for participating in the computer tasks the top three 'money earners' on one of tasks will be will be awarded with gift vouchers (1st place $100; 2nd and 3rd place $50).

The questionnaire in this study includes:

1. A demographic questionnaire.
2. A depression and anxiety questionnaire.
3. An impulsivity questionnaire.
4. A sensation seeking questionnaire.
5. A sensitivity to punishments and rewards questionnaire.
6. Alcohol use questionnaires.

Your responses will be completely anonymous and confidential. The results of this study may be published in a scientific journal, however only group data will be presented and no individual will be identifiable.

Your participation in this study is completely voluntary. Your initial agreement to participate does not stop you from discontinuing participation and you are free to withdraw at any time.

This research conforms to the principles set out in the Swinburne University of Technology Policy on Research Ethics and the NHMRC guidelines as specified in the National Statement on Ethical Conduct Research Involving Humans.

Please consider the purposes and time commitment of this study before you decide whether or not to participate. Retain this information sheet for your own records.

If you have any questions about this study, please contact the Investigators:

Alvin Noveloso – (email: anoveloso@swin.edu.au)
Dr. Simon Knowles (email: sknowles@swin.edu.au; phone: 9214 8206)
Prof. Mike Kyrios – (email: mkyrios@swin.edu.au; phone: 9214 4886)

If at any time you feel distressed or concerned about some of your answers relating to the study please feel free to contact the supervisors of this project. Alternatively, you may wish to contact a counsellor (e.g., Swinburne Student Counselling Service on 9214 8025) or your local health practitioner

If you have any queries or concerns which the Principal Investigator was unable to satisfy, contact:
The Chair, SBS Research Ethics Committee
Faculty of Life and Social Sciences, Mail H24
Swinburne University of Technology, Hawthorn, Victoria, 3122

If you have a complaint about the way you were treated during this study please write to"
The Chair, Human Research Ethics Committee
Swinburne University of Technology, Hawthorn, Victoria, 3122

SWINBURNE UNIVERSITY OF TECHNOLOGY

Consent Form

Exploring the Relationships between Personality and Behavioural correlates of Risk-Taking in Binge Drinking and Compulsive Buying.

Investigators: Tania Fittkau
Alvin Noveloso
Dr. Simon Knowles (Supervisor)
Prof. Mike Kyrios (Associate Supervisor)

As part of the first phase of this project (online survey) you were required to develop a unique identification code. In this second phase, you will be asked to complete a fun 20 minute virtual risk-taking and buying activity in the SwinPsych Research laboratories (3rd floor of Applied Science Building). As an extra reward for participating in the computer tasks the top three 'money earners' on one of tasks will be awarded with gift vouchers (1st place $100; 2nd and 3rd place $50).

I _____ have read (or, as appropriate have read to me) and understood the information above. Any questions I have asked have been answered to my satisfaction.

I agree to participate in this activity, realising that I may withdraw at any time.

I agree that research data collected for the study may be published or provided to other researchers on the condition that anonymity is preserved and that I cannot be identified.

NAME OF PARTICIPANT..... .....

SIGNATURE..... DATE .....

NAME OF PRINCIPAL INVESTIGATOR..... .....

SIGNATURE..... DATE .....

Please answer these questions as accurately as possible. Be assured that you cannot be identified from your responses. However, if you are only 59 year old male in first year psychology, you may wish to omit age and sex.

1 Gender

Male
Female

2 Your age (DD-MM-YYYY)_____

3 Marital status

Single
Attached
Married
Separated
Divorced
Widowed

4 Your highest educational level

Secondary
Trade Qualification
TAFE or Diploma Level
Incomplete Tertiary
Complete Tertiary
Postgraduate

5 Country of birth_____

6 Nationality_____

Please read the following statements carefully. For each statement circle the answer that represents your opinion.

1	Do you often buy things on impulse?	Yes	No
2	Do you generally do and say things without stopping to think?	Yes	No
3	Do you often get into a jam because you do things without thinking?	Yes	No
4	Are you an impulsive person?	Yes	No
5	Do you usually think carefully before doing anything?	Yes	No
6	Do you often do things on the spur of the moment?	Yes	No
7	Do you mostly speak before thinking things out?	Yes	No
8	Do you often get involved in things you later wish you could get out of?	Yes	No
9	Do you get so 'carried away' by new and exciting ideas, that you never think you (of) possible snags?	Yes	No
10	Do you need to use a lot of self-control to keep out of trouble?	Yes	No
11	Would you agree that almost everthing enjoyable is illegal or immoral?	Yes	No
12	Are you often suprised at people's reactions to what you do or say?	Yes	No
13	Do you think an evening out is more successful if it is unplanned or arranged at the last moment?	Yes	No
14	Do you usually work quickly, without bothering to check?	Yes	No
15	Do you often change your interests?	Yes	No
16	Before making up your mind, do you consider all the advantages and disadvantages?	Yes	No
17	Do you prefer to 'sleep on it' before making decisions?	Yes	No
18	When people shout at you, do you shout back?	Yes	No
19	Do you usually make up your mind quickly?	Yes	No

Each of the items below contains two choices A and B. Please indicate which of the choices most describes your likes or the way you feel. In some cases you may find items in which both choices describes your likes or feelings. Please choose the one which better describes your likes or feelings. In some cases you may find items in which you do not like either choice. In these cases mark the choice you dislike least.

Do not leave any items blank. It is important you respond to all items with only one choice, A or B. We are interested only in your likes and feelings, not in how others feel about these things or how one is supposed to feel. There are no right or wrong answers as in other kinds of tests. Be frank and give your honest appraisal of yourself.

1	A	I like "wild" uninhibited parties.
	B	I prefer quiet parties with good conversation.
2	A	There are some movies I enjoy seeing a second or even a third time.
	B	I can't stand watching a move that I've seen before.
3	A	I often wish I could be a mountain climber.
	B	I can't understand people who risk their necks climbing mountains
4	A	I dislike all body odors.
	B	I like some of the earthy body smells.
5	A	I get bored seeing the same old faces.
	B	I like the comfortable familiarity of everyday friends.
6	A	I like to explore a strange city or section of town by myself, even if it means getting lost.
	B	I prefer a guide when I am in a place I don't know well.
7	A	I dislike people who do or say things just to shock or upset others.
	B	When you can predict almost everything a person will do and say he or she must by a bore.
8	A	I usually don't enjoy a movie or play where I can predict what will happen in advance.
	B	I don't mind watching a movie or play where I can predict what will happen in advance.
9	A	I have tried marijuana or would like to.
	B	I would never smoke marijuana.
10	A	I would not like to try any drug which might produce strange and dangerous effects on me.
	B	I would like to try some of the drugs that produce hallucinations.
11	A	A sensible person avoids activities that are dangerous.
	B	I sometimes like to do things that are a little frightening.

12	A	I dislike "swingers" (people who are uninhibited and free about sex).
	B	I enjoy the company of real "swingers".
13	A	I find that stimulants make me uncomfortable.
	B	I often like to get high (drinking liquor or smoking marijuana).
14	A	I like to try new foods that I have never tasted before.
	B	I order the dishes with which I am familiar so as to avoid disappointment and unpleasantness.
15	A	I enjoy looking at home movies, videos, or travel slides.
	B	Looking at someone's home movies, videos, or travel slides bores me tremendously.
16	A	I would like to take up the sport of water skiing.
	B	I would not like to take up water skiing.
17	A	I would like to try surfboard riding.
	B	I would not like to try surfboard riding.
18	A	I would like to take off on a trip with no preplanned or definite routes, or timetable.
	B	When I go on a trip I like to plan my route and timetable fairly carefully.
19	A	(A) I prefer the "down to earth" kinds of people as friends.
	B	I would like to make friends in some of the "far-out" groups like artists or "punks."
20	A	I would not like to learn to fly an airplane.
	B	I would like to learn to fly an airplane.
21	A	I prefer the surface of the water to the depths.
	B	I would like to go scuba diving.
22	A	I would like to meet some persons who are homosexual (men or women).
	B	I stay away from anyone I suspect of being "gay" or "lesbian."
23	A	I would like to try parachute jumping.
	B	I would never want to try jumping out of a plane, with or without a parachute.
24	A	I prefer friends who are excitingly unpredictable.
	B	I prefer friends who are reliable and predictable.
25	A	I am not interested in experience for its own sake.
	B	I like to have new and exciting experiences and sensations even if they are a little frightening, unconventional, or illegal.
26	A	The essence of good art is in its clarity, symmetry of form, and harmony of colours.
	B	I often find beauty in the "clashing" colours and irregular forms of modern paintings.
27	A	I enjoy spending time in the familiar surroundings of home.
	B	I get very restless if I have to stay around home for any length of time.

28	A	I like to dive off the high board.
	B	I don't like the feeling I get standing on the high board (or I don't go near it at all).
29	A	I like to date persons who are physically exciting.
	B	I like to date persons who share my values.
30	A	Heavy drinking usually ruins a party because some people get loud and boisterous.
	B	Keeping the drinks full is the key to a good party.
31	A	The worst social sin is to be rude.
	B	The worst social sin is to be a bore.
32	A	A person should have considerable sexual experience before marriage.
	B	It's better if two married persons begin their sexual experience with each other.
33	A	Even if I had the money, I would not care to associate with flighty rich persons in the "jet set."
	B	I could conceive of myself seeking pleasures around the world with the "jet set."
34	A	I like people who are sharp and witty even if they do sometimes insult others.
	B	I dislike people who have their fun at the expense of hurting the feelings of others.
35	A	There is altogether too much portrayal of sex in movies.
	B	I enjoy watching many of the "sexy" scenes in movies.
36	A	I feel best after taking a couple of drinks.
	B	Something is wrong with people who need liquor to feel good.
37	A	People should dress according to some standard of taste, neatness, and style.
	B	People should dress in individual ways even if the effects are sometimes strange.
38	A	Sailing long distances in small sailing crafts is foolhardy.
	B	I would like to sail a long distance in a small but seaworthy sailing craft.
39	A	I have no patience with dull or boring persons.
	B	I find something interesting in almost every person I talk to
40	A	Skiing down a mountain slope is a good way to end up on crutches.
	B	I think I would enjoy the sensations of skiing very fast down a high mountain slope

Please read the following statements carefully. For each statement circle the answer that represents your opinion.

1	Do you often refrain from doing something because you are afraid of it being illegal?	Yes	No
2	Does the good prospect of obtaining money motivate you strongly to do some things?	Yes	No
3	Do you prefer not to ask for something when you are not sure you will obtain it?	Yes	No
4	Are you frequently encouraged to act by the possibility of being valued in your work, in your studies, with your friends or with family?	Yes	No
5	Are you often afraid of new or unexpected situations?	Yes	No
6	Do you often meet people that you find physically attractive?	Yes	No
7	Is it difficult for you to telephone someone you do not know?	Yes	No
8	Do you like to take some drugs because of the pleasure you get from them?	Yes	No
9	Do you often renounce your rights when you know you can avoid a quarrel with a person or an organisation?	Yes	No
10	Do you often do things to be praised?	Yes	No
11	As a child, were you troubled by punishments at home or in school?	Yes	No
12	Do you like being the center of attention at a party or a social meeting?	Yes	No
13	In tasks that you are not prepared for, do you attach great importance to the possibilty of failure?	Yes	No
14	Do you spend a lot of time on obtaining a good image?	Yes	No
15	Are you easily discouraged in difficult situations?	Yes	No
16	Do you need people to show their affection for you all the time?	Yes	No
17	Are you a shy person?	Yes	No
18	When you are in a group, do you try to make your opinions the most intelligent or funniest?	Yes	No
19	Whenever possible, do you avoid demonstrating your skills for fear of being embarrassed?	Yes	No
20	Do you often take the opportunity to pick up people you find attractive?		
21	When you are with a group, do you have difficulties selecting a good topic to talk about?	Yes	No
22	As a child, did you do a lot of things to get people's approval?	Yes	No
23	Is it often difficult for you to fall asleep when you think about things you have done or must do?	Yes	No
24	Does the possibility of social advancement move you to action, even if this involves not playing fair?	Yes	No

25	Do you think a lot before complaining in a restaurant if your meal is not well prepared?	Yes	No
26	Do you generally give preference to those activities that imply an immediate gain?	Yes	No
27	Would you be bothered if you had to return to a store when you noticed you were given the wrong change?	Yes	No
28	Do you often have troubled resisting the temptation of doing forbidden things?	Yes	No
29	Whenever you can, do you avoid going to unknown places?	Yes	No
30	Do you like to compete and do everything you can to win?	Yes	No
31	Are you often worried by things that you said or did?	Yes	No
32	Is it easy for you to associate tastes and smells to very pleasant events?	Yes	No
33	Would it be difficult for you to ask your boss for a raise (salary increase)?	Yes	No
34	Are there a large number of objects or sensations that remind you of pleasant events?	Yes	No
35	Do you generally try to avoid speaking in public?	Yes	No
36	When you start to play with a slot machine, is it often difficult for you to stop?	Yes	No
37	Do you, on a regular basis, think that you could do more things if it was not for your insecurity or fear?	Yes	No
38	Do you sometimes do things for quick gains?	Yes	No
39	Comparing yourself to people you know, are you afraid of many things?	Yes	No
40	Does your attention easily stray from your work in the presence of an attractive stranger?	Yes	No
41	Do you often find yourself worrying about things to the extent that performance in intellectual abilities is impaired?	Yes	No
42	Are you interested in money to the point of being able to do risky jobs?	Yes	No
43	Do you often refrain from doing something you like in order not to be rejected or disapproved by others?	Yes	No
44	Do you like to be competitive in all of your activities?	Yes	No
45	Generally, do you pay more attention to threats than to pleasant events?	Yes	No
46	Would you like to be a socially powerful person?	Yes	No
47	Do you often refrain from doing something because of your fear of being embarrassed?	Yes	No
48	Do you like displaying your physical abilities even though this may involve danger?	Yes	No

Please select the answer that is correct for you.

1 How often do you have a drink containing alcohol?

Never

Monthly or less

2 to 4 times a month

2 to 3 times a week

4 or more times a week

2 How many drinks containing alcohol do you have on a typical day when you are drinking?

1 or 2

3 or 4

2 to 4 times a month

2 to 3 times a week

4 or more times a week

3 How often do you have six or more drinks on one occasion?

Never

Less than monthly

Monthly

Weekly

Daily or almost daily

4 How often during the last year have you found it difficult to get the thought of alcohol out of your mind?

Never

Less than monthly

Monthly

Weekly

Daily or almost daily

5 How often during the last year have you found that you were not able to stop drinking once you had started?

Never

Less than monthly

Monthly

Weekly

Daily or almost daily

6 How often during the last year have you been unable to remember what happened the night before because you had been drinking?

Never

Less than monthly

Monthly

Weekly

Daily or almost daily

7 How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?

Never

Less than monthly

Monthly

Weekly

Daily or almost daily

8 How often during the last year have you had a feeling of guilt or remorse after drinking?

Never

Less than monthly

Monthly

Weekly

Daily or almost daily

9 Have you or someone else been injured as a result of your drinking

No

Yes, but not in the last year

Yes, during the last year

10 Has a relative or friend or a doctor or another health worker been concerned about your drinking or suggested you cut down?

No

Yes, but not in the last year

Yes, during the last year

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

1	I found myself getting upset by quite trivial things	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I just couldn't seem to get going	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I had a feeling of shakiness (eg, legs going to give way)	0	1	2	3
8	I found it difficult to relax	0	1	2	3
9	I found myself in situations that made me so anxious I was most relieved when they ended	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting upset rather easily	0	1	2	3
12	I felt that I was using a lot of nervous energy	0	1	2	3
13	I felt sad and depressed	0	1	2	3
14	I found myself getting impatient when I was delayed in any way (eg, lifts, traffic lights, being kept waiting)	0	1	2	3
15	I had a feeling of faintness	0	1	2	3
16	I felt that I had lost interest in just about everything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I perspired noticeably (eg, hands sweaty) in the absence of high temperatures or physical exertion	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life wasn't worthwhile	0	1	2	3
22	I found it hard to wind down	0	1	2	3

23	I had difficulty in swallowing	0	1	2	3
24	I couldn't seem to get any enjoyment out of the things I did	0	1	2	3
25	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
26	I felt down-hearted and blue	0	1	2	3
27	I found that I was very irritable	0	1	2	3
28	I felt I was close to panic	0	1	2	3
29	I found it hard to calm down after something upset me	0	1	2	3
30	I feared that I would be "thrown" by some trivial but unfamiliar task	0	1	2	3
31	I was unable to become enthusiastic about anything	0	1	2	3
32	I found it difficult to tolerate interruptions to what I was doing	0	1	2	3
33	I was in a state of nervous tension	0	1	2	3
34	I felt I was pretty worthless	0	1	2	3
35	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
36	I felt terrified	0	1	2	3
37	I could see nothing in the future to be hopeful about	0	1	2	3
38	I felt that life was meaningless	0	1	2	3
39	I found myself getting agitated	0	1	2	3
40	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
41	I experienced trembling (eg, in the hands)	0	1	2	3
42	I found it difficult to work up the initiative to do things	0	1	2	3

Appendix B

BART instructions

Throughout the task, you will be presented with 30 balloons, one at a time. For each balloon you can click on the button labelled *Click Here* to pump up the Balloon to increase the size of the balloon. You will accumulate 5 cents in a temporary bank for each pump. You will not be shown the amount you have accumulated in your temporary bank. At any point, you can stop pumping up the balloon and click on the button labelled *Collect $$$*. Clicking this button will start you on the next balloon and will transfer the accumulated money from your temporary bank to your permanent bank labelled *Total Score*. It is your choice to determine how much to pump up the balloon, but be aware that at some point the balloon will explode. The explosion point varies across balloons, ranging from the first pump to enough pumps to make the balloon fill the entire computer screen. If the balloon explodes before you click on *Collect $$$*, then you move on to the next balloon and all money in your temporary bank is lost. Exploded balloons do not affect the money accumulated in your permanent bank. At the end of the task, the three highest money earners will be awarded with a gift voucher (i.e., 1st place $100; 2nd and 3rd place $50).