Personality, Coping, Motives for Substance Use, and Mood examined in a Sample of Substance Using Young Adults

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ABSTRACT

The aim of this thesis was to explore the relationship between young adults substance use and four established risk factors, namely personality, coping strategies, motives for use, and affect, using Gray's biological theory of personality. In addition, a subcomponent focused more specifically on the measurement and structure of the construct of impulsivity, a personality trait that has consistently emerged as an important risk factor in substance use problems.

Participants, aged 16-30 years, were recruited from drug treatment agencies around Melbourne, Australia. In Study One, information was collected from 119 young people, with respect to their substance use, personality traits, coping strategies, motives for use, and affect via interview and self-report questionnaires. Specific risk factors, such as coping motives for use, 'trait impulsivity' and emotion-oriented coping all contributed unique variance to substance use outcomes measures. In addition, multiple risk factors were found to be predictive of substance use, such as emotion-oriented and enhancement motives; low 'trait anxiety', avoidance coping, coping motives for use and negative affect; and finally 'trait impulsivity' and social motives. However, mixed and inconsistent results also emerged, where no risk factors were predictive of substance use outcomes.

Study Two examined the convergent validity between self-report and neuropsychological measures of two components of impulsivity, namely 'rash impulsivity' and 'reward sensitivity'. Sixty participants from Study One comprised this sample. The self-report measures of impulsivity did not significantly correlate with one another, indicating that they measure different aspects of this construct. None of the self-report measures correlated with the behavioural tasks, indicating that these tasks were not valid measures of the two components of impulsivity. The two behavioural tasks of 'reward sensitivity' significantly positively correlated with each other, suggesting that they tap into the same reward component of impulsivity.

These findings confirm the multifactorial nature of impulsivity, and highlight the need for further exploration into the structure of this construct. Furthermore, these findings indicate that there is no clear and simple relationship between risk factors and substance use. It is argued that future research will benefit from drawing on theoretical models to account for the different interactions between risk and protective

factors, thereby elucidating the mechanisms underpinning the development of substance use problems.

DECLARATION

This is to certify that

(i) the thesis comprises only my original work,

(ii) due acknowledgement has been made in the text to all other material used,

(iii) the thesis is less than 30,000 words in length, exclusive of tables, maps, bibliographies, appendices and footnotes.

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Erin May Cowley

August 2006

ETHICS DECLARATION

I, Erin May Cowley, declare that the research reported in this thesis was conducted in accordance with the principles for the ethical treatment of human participants as approved for this research by the NorthWestern Mental Health Research and Ethics Committee.

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Erin May Cowley

August 2006

Annie

25/09/48 – 14/07/06

This thesis is dedicated to my godmother, Annie, who passed away during the final stages of my doctorate. You taught me so much, including that the most important things in life, are people. I will always remember your sense of humour and your fantastic laugh. You were a very special lady, and will be sorely missed. You will always hold a special place in my heart.

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CHAPTER ONE
INTRODUCTION

Why study substance use in young people?

There are high rates of substance use amongst young people (Matthews et al., 2002; White, Hayman, Tempany, & Szabo, 2004), and many of these substances are initially used and experimented with in adolescence. Alcohol and cannabis are the most commonly used substances amongst adolescents aged between 12 and 17 years, with 84% of secondary school students in Victoria reporting alcohol use and 20% reporting cannabis use in the last year (White et al., 2004). In addition, studies indicate that the average age of initial illicit drug use occurs in young people, with average ages ranging from 18.6 years for inhalants to 25.2 years for sleeping pills (Australian Institute of Health and Welfare, 2005). Of those individuals who experiment with substance use, a proportion will go on to develop a Substance Use Disorder (SUD) (DSM-IV, American Psychiatric Association, 2000). For Australian adolescents who experiment with cannabis, it is estimated that between 10% (Rey, Sawyer, Raphael, Patton, & Lynskey, 2002) and 20% (Coffey, Carlin, Lynskey, Li, & Patton, 2003) will progress to the diagnosis of cannabis dependence. The prevalence of alcohol dependence in the Australian general population, is estimated at 4.1%, and is most common among single males aged 18 to 34 years (Proudfoot & Teesson, 2002), with ages 20-29 years being the highest risk group for alcohol and drug related harm associated with use in both males and females (Australian Institute of Health and Welfare, 2005).

SUD has significant negative social, educational, and occupational outcomes, including over-dose related death, crime involvement, and community and family distress (Proudfoot & Teesson, 2002). In addition, an early onset of problem substance use has been shown to be related to more significant substance abuse problems in later life (Wills, Sandy, & Yaeger, 2000), whilst people with late onset substance use, typically use recreationally and are less likely to experience significant problems. Therefore examining substance use behaviours in a younger population, and ultimately intervening with this age group, is an important priority.

Reasons behind the use and abuse of substances by young people are numerous and multifaceted. A growing body of research has identified a plethora of potential genetic, demographic, temperamental, social, family and environmental risk factors for both the onset of substance use and development of a SUD , such as a family history of substance abuse, peer substance use, low socioeconomic status, and avoidant coping strategies (Brook et al., 2001; Gilvarry, 2000; Howard & Jenson, 1998; Jenkins & Zunguze, 1998; Killen et al., 1997; Wills, Cleary et al., 2001; Wills, Sandy, Yaeger, Cleary, & Shinar, 2001). In addition, a range of protective factors, which make substance use less likely, have been identified, including family support and active coping strategies, such as information seeking and decision-making (Botvin, Malgady, Griffin, Scheier, & Epstein, 1998; Wills, Sandy et al., 2001).

It has become apparent that there are a number of complex relationships between these risk and protective factors that contribute to the development of a SUD in young people. It is an important research priority to investigate multiple risk factors within a single sample, to explore the effects that these factors have on substance use behaviours, with the aim to eventually introduce a model of substance use that will incorporate these interactions within the developmental context of these disorders. This will require researchers to take a more theoretical approach, to include the investigation of the mechanisms that may underlie risk factors for SUD, and their subsequent interactions on substance use behaviours. Drawing on and integrating the different disciplines involved in the investigation of SUD will assist this process.

To date, research aimed at identifying social and psychological risk factors for substance use has relied heavily on self-report methodology, and has been conducted relatively independently of substance use research with a neurological or neuropsychological focus. The neurological research on substance use has included the examination of the brain systems, which may act as mediators for reinforcing effects of drugs (Di Chiara, 1999; Martin-Soelch et al., 2001), the measurement of brain-related activity in substance users while performing behavioural tasks (Kaufman, Ross, Stein, & Garavan, 2003), and the long term effects of substance use on the brain amongst chronic users (Jentsch & Taylor, 1999; Rogers & Robbins, 2003).

In order to be better informed on mechanisms underpinning substance use, it is important to synthesise these neurological and behavioural lines of research with

current self-report research and literature on risk and protective factors within a sound theoretical framework. The present study will investigate a significant number of already established risk factors, namely personality, coping resources, motives for use, and affect, within a single clinical sample. Furthermore, personality will be measured using Gray's (1970; 1981) model, a theory driven, and biologically based model of personality, as an initial step towards informing a theoretical basis of substance use problems. Gray's personality traits are termed 'trait anxiety' and 'trait impulsivity', and are differentiated according to the functioning of neural systems and processes. These personality traits are hypothesised to have an effect on other behavioural aspects of the individual, such as coping resources, motives behind substance use and affect, thereby providing a theoretical basis for linking together already established neurological and psychological risk factors for substance use.

In addition to using Gray's (1970; 1981) model, neuropsychological, and self-report measures of impulsivity will be utilised to allow a multimodal approach to measuring impulsivity. Impulsivity has consistently been identified as an important risk factor in substance use literature (Byrne, Byrne, & Reinhart, 1994; Cooper, Agocha, & Sheldon, 2000; Krueger, 1999; Sher, Bartholow, & Wood, 2000; Sher & Trull, 1994). However, there has been a significant amount of debate about the multi-factorial nature of impulsivity (Dawe, Gullo, & Loxton, 2004; Evenden, 1999; Miller, Joseph, & Tudway, 2004; Patton, Stanford, & Barratt, 1995), and a number of criticisms regarding the measurement of this construct (Milich, Hartung, Martin, & Haigler, 1994; Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001). Using a multimodal approach will help to establish links between these different lines of research, and to identify the impulsivity characteristics present in this substance using population.

Specifically, the current study aimed to examine the relationship between substance use outcome variables and four important risk factors for SUD, namely: personality, coping, motives for substance use, and affect amongst young people with a SUD, using a biological theory of personality. In addition, multimodal measures of impulsivity, including self-report questionnaires and neuropsychological tasks, were used to explore the personality trait of impulsivity.

Format of Thesis

This thesis is divided into four chapters. The first chapter provides an introduction to this thesis, and includes a review of the relevant literature. The review includes information about the established risk factors for SUD that have been investigated in the current study, and their evidence base. Topics covered include: neuropsychological evidence, the personality factors of impulsivity and neuroticism, coping strategies, motives for substance use, and affect regulation. Gray's (1970; 1981) Theory of Personality is then introduced and reviewed, including the different physiological systems that are involved, as well as evidence in support of this theory. The chapter concludes with the aims and hypotheses of the current research.

Chapter 2 describes the first study that was conducted as part of this thesis. It includes a short introduction, the method, results and a short discussion related specifically to the findings from this study.

Chapter 3 describes the second study that was conducted as part of this thesis. It includes a short introduction, the method, results and a short discussion specifically related to the findings from this study.

Chapter 4, the final chapter in this thesis, provides the concluding discussion. The implications of the findings to the current concept of substance use, the relation to Gray's (1970; 1981) theory of personality, and the current concept of impulsivity are discussed. This is followed by limitations of the current study, and proposed future directions.

Substance Use Disorders

As highlighted previously, the significant negative social impact that substance use has on both the individual and the community (Proudfoot & Teesson, 2002), makes research into this area a priority. In addition, findings regarding the increased negative effect of early onset SUD highlight the importance of investigating substance use in a population of young people (Australian Institute of Health and Welfare, 2005; James, Moore, & Gregersen, 1996; Wills et al., 2000). One approach to moving forward within this line of research is to examine the current evidence in different research domains, and better integrate the current resources and literature available.

Neuropsychological Research

Much of the neuropsychological data regarding substance use comes from investigations of differences in chronic users and non-users, using neuro-imaging or performance on behavioural tasks (Kaufman et al., 2003; Rogers & Robbins, 2003). The reliance on the use of samples of chronic users, who have been exposed to substances for an extended period of time, has made the separation of cause and effect difficult. Therefore, no clear conclusions can be drawn about whether differences found are due to the aetiology of the disorder, or whether the effects are the result of long-term abuse of the specific substances (Rogers & Robbins, 2003). Also, this line of research lacks a sound theoretical basis, as solely identifying the effects of substance use does little to inform on the process of how or why these effects might develop.

Historically, research in this area has focused on the reinforcing effects of drug abuse on the limbic system, which include the midbrain, striatum, orbitofrontal cortex and the nucleus accumbens (Apicella, Ljungberg, Scarnati, & Schultz, 1991; Elliott, Frith, & Dolan, 1997; Ljungberg, Apicella, & Schultz, 1991). Drugs of abuse have been shown to increase dopamine levels in these limbic regions, which are the areas of the brain that are involved in the reinforcement of stimuli and reward processing (Martin-Soelch et al., 2001). The resultant increase noted in dopamine levels in substance using populations is insufficient to entirely account for drug abuse and dependence, and more complex interactions continue to be investigated (Martin-Soelch et al., 2001). Goldstein and Volkow (2002) theorise that dopamine's involvement in SUD is mediated by other structural and functional changes in circuits that are modulated by dopamine, including the frontal cortex. Serotonergic and opioidergic neurotransmitter systems, also, have been implicated in the control of alcohol related behaviours (Kranzler & Anton, 1994), however research is limited by the current understanding of the brain's mechanisms and neurotransmitters. Thus, it remains unclear whether these systems have a direct effect or are modulated by a third system, such as the dopamine neurotransmitter system.

In summary, it is clear that dopamine has a role to play in SUD, although whether it has a direct influence, influences other neurotransmitter systems or whether both mechanisms occur, remains uncertain. As highlighted above, it is unclear, also, how much these processes contribute to the formation of a SUD, or whether identified

changes in the brain are the consequence of substance use behaviours. More longitudinal research is needed to investigate these questions, in particular, focusing on younger individuals who are only beginning to experiment with substance use. In addition, neuropsychological and behavioural research needs to be integrated with evidence from other fields, and put within a contextual framework before the development of SUD can be fully understood.

Personality Characteristics and Substance Use

Substance use research has shown a clear genetic link between personality characteristics and SUD, with findings indicating that individuals may inherit a disposition for problem drinking (Cadoret et al., 1995; Swadi, 1999). Other studies (Comings, 1997; Kreek, Nielsen, Butelman, & LaForge, 2005) have extended this research, by showing that siblings and twins who are born to parents with drug dependence, show a genetic disposition to drug abuse in general. Some of this heritability is hypothesised to be due to inherited personality traits (Kreek et al., 2005). Personality has been widely studied in an attempt to clarify the connection between specific traits and substance use, with the personality characteristics of impulsivity and neuroticism identified as important risk factors for the development of a SUD (Brook et al., 2001; Cooper et al., 2000; Pandina, Johnson, & Labouvie, 1992).

Impulsivity and Substance Use

Impulsivity and related constructs (such as novelty-seeking and sensation-seeking), when measured in childhood, have been found to be associated with the development of adult substance use problems (Tarter, 2002; Tarter et al., 1999). Cross-sectional studies have reported that impulsivity and novelty-seeking were associated with alcohol and substance abuse (Sher, Walitzer, Wood, & Brent, 1991), both in clinical (Adams et al., 2003; McCormick, Dowd, Quirk, & Zegarra, 1998) and non-clinical samples (Flory, Lynam, Milich, Leukefeld, & Clayton, 2002; Grau & Ortet, 1999). Grau and Ortet (1999) investigated Spanish non-alcoholic women using the Karolinska Scale of Personality (KSP, Klinteberg, Schalling, & Magnusson, 1986) and the Spanish version of the Eysenck Personality Questionnaire (EPQ, Eysenck & Eysenck, 1997), and found positive correlations between alcohol consumption and impulsivity and sensation-seeking traits. Using the EPQ (Eysenck & Eysenck, 1975)

and Cloninger's Tridimensional Personality Questionnaire (TPQ, Cloninger, Przybeck, & Syrakic, 1991), in a follow-up study of people on the Australian Twin Registry, Heath and others (1997) found that the only personality trait that showed a prominent role in lifetime history of alcoholism was novelty-seeking.

In a longitudinal study conducted with adolescents, Sher et al. (2000) found the personality traits that correlated with impulsivity (disinhibition and behavioural under-control), as measured by the EPQ (Eysenck & Eysenck, 1975) and the TPQ (Cloninger et al., 1991), were the most consistent predictors of substance use disorders, both at the initial time of interview, and in a prospective follow-up. They concluded that this novelty-seeking dimension of personality "should be considered an extremely important personality factor in determining which late adolescent or young adults may be at risk of developing problems with tobacco and other drugs by the time they reach their mid-20's" (p. 826). These findings regarding the role of impulsivity and substance use disorders have been found to be consistent across samples of both adolescents and adults (Cloninger, Sigvardsson, & Bohman, 1988; Howard, Kivlahan, & Walker, 1997; Masse & Tremblay, 1997; McGue, Iacono, Legrand, Malone, & Elkins, 2001; Sher et al., 2000).

Problems with the construct of Impulsivity

Although there is significant and consistent evidence that demonstrates impulsivity is an important predictor of SUD, the implications of these findings are unclear, as this construct has been criticised on a number of methodological and theoretical grounds. Criticisms include: inconsistent definitions used in the clinical research literature, the lack of concurrent validity between various measures of impulsivity (particularly between multi-modal measures, such as self-report and behavioural measures), and the lack of a theory-driven approach in research when using this construct (Milich et al., 1994; Moeller et al., 2001).

Recently, researchers have attempted to overcome these problems by re-defining impulsivity as a multi-factorial construct (Dawe et al., 2004; Evenden, 1999; Miller et al., 2004; Patton et al., 1995). Principal component analyses have revealed that impulsivity may be comprised of up to three factor structures including: restlessness/distractibility, disorganisation, and carefree attitudes/behaviours (Gerbing, Ahadi, & Patton, 1987); motor, non-planning and cognitive impulsiveness

(Patton et al., 1995); and fun seeking, reward responsiveness and drive (Carver & White, 1994). Other studies have revealed two factor component structures, comprising cautious and spontaneous impulsivity (Parker, Bagby, & Webster, 1993), and dysfunctional and functional impulsivity factors (Dickman, 1990). In a recent review of factor analytic studies (Caseras, Avila, & Torrubia, 2003; Miller et al., 2004; Quilty & Oakman, 2004; Zelenski & Larsen, 1999) investigating multiple domains of impulsivity, Dawe and others (2004) concluded that the factor structure of impulsivity comprised two factors, which they termed 'rash impulsivity' and 'reward sensitivity'.

Measurement of Impulsivity

As stated above, there is no accepted or consistent definition of impulsivity (Harmstead & Lester, 2000; Quilty & Oakman, 2004), and the different operational definitions of impulsivity that have been proposed are highly dependent on the differing theoretical suppositions of the researcher (Pulkinnen, 1986). Given these differences in terminology and theory, a number of different ways to assess and measure this construct have been proposed, including an array of self-report questionnaires, behavioural tasks, and neurological measures (e.g. event-related potentials) (Avila, Barros, Ortet, Parcet, & Ibanez, 2003; Dougherty et al., 2003; Evenden, 1999; Spinella, 2004).

Evenden (1999) used delayed response tasks in laboratory settings, and found that different procedures provided independent scores of impulsivity, that reflected three different domains of impulsivity. These were formulated as 1) preparation, where not all information is taken into account before making a decision; 2) execution outcome, when the behaviour is terminated before the goal is reached; and 3) premature responding, responding before discriminating information available. Spinella (2004) used tasks, such as go/no-go and antisaccades to explore impulsivity, and demonstrated increased activity in prefrontal function, a result indicating support for a role of the prefrontal cortex in impulse control. The go/no-go task was found to correlate positively to a self-report measure of impulsivity, that is the Barratt Impulsiveness Scale (BIS-11, Patton et al., 1995), while the results from the antisaccades task correlated negatively with the BIS-11.

The go/no-go task, described as a behavioural impulsivity task, has been used in a number of different studies to investigate substance use (Kamarajan et al., 2005; Kamarajan et al., 2006), and has been shown to have reasonable temporal stability (Kindlon, Mezzacappa, & Earls, 1995). Using a go/no-go task and measuring event-related potentials, Kamarajan et al. (2005) found that both response activation and response inhibition were dysfunctional in a group of alcohol dependent subjects, as compared with age-matched controls. The authors concluded that alcoholics display deficient cognitive processing mechanisms.

Another behavioural method used to measure impulsivity is the delayed discounting task (DDT, Alessi & Petry, 2003; Petry & Casarella, 1999; Reynolds, Karraker, Horn, & Richards, 2003), which operationalises impulsivity as the 'choosing of a smaller immediate reward over a larger, delayed reward' (Carey & Carey, ; 1999). In accordance with impulsivity literature on substance use, a number of studies have found that substance users display increased levels of impulsivity, by discounting the value of the delayed rewards quicker, as compared with non-substance users (Bickel & Marsch, 2001). This finding has been noted in individuals using different substances, including smokers (Bickel, Odum, & Madden, 1999; Mitchell, 1999; Reynolds et al., 2003), alcoholics (Petry, 2001a), and heroin addicts (Kirby, Petry, & Bickel, 1999).

Petry and Cassella (1999) argued that choosing an immediate smaller reward can influence many decisions in substance users, which is evidenced when users chose the immediate benefit of intoxication over the longer-term benefits associated with a change in life-style. Therefore, continued substance use occurs even when it is clear that the individual believes that a drug-free life style will be more beneficial in the long-term (Bickel & Marsch, 2001).

A recent study using the DDT demonstrated that early onset alcoholics had higher levels of impulsive decision-making, when compared with late onset alcoholics and a matched control group (Dom, D'haene, Hulstijn, & Sabbe, 2006). This finding highlighted the association between impulsiveness and substance use, and also, the difference between early-onset and late-onset groups, suggesting the need to separate individuals into early- and late-onset, and the need for early intervention. A criticism of the DDT is that it frequently uses hypothetical rewards, which may not reflect actual outcomes (Bickel & Marsch, 2001), although Kirby (1997) argued against this

view. He posited that using hypothetical rewards is a valid method, as the discounting function is still observed, however he acknowledged that results may be biased towards less discounting when hypothetical rewards are used. Support for delayed discounting as a measure of impulsivity, has been shown in populations where impulsivity is considered to be a core feature, such as people diagnosed with bipolar disorder (Crean, de Wit, & Richards, 2000) and pathological gamblers (Alessi & Petry, 2003; Petry & Casarella, 1999). Rates of delay discounting, also, have been correlated to personality questionnaires of impulsivity (Kirby et al., 1999; Petry, 2001a, 2001b), however, other research has failed to find these correlations (Reynolds, Ortengren, Richards, & de Wit, 2006).

The impulsivity construct can be further clarified, by exploring correlations between different measures of impulsivity, as although self-report and behavioural measures have been used extensively in separate research studies, they are rarely used within a single study. As such, relatively little is known about how these measures of impulsivity relate to one another (White et al., 1994). Reynolds et al. (2006) used healthy subjects to test a number of impulsivity measures, both self-report and behavioural. They found that two components emerged, namely 'impulsive decision-making', and 'impulsive disinhibition'. The DDT task was a part of the 'impulsive decision-making' component, while the go/no-go task was part of the 'impulsive disinhibition'. They concluded that various self-report and behavioural measures each target different components of impulsivity.

Kindlon and colleagues (1995) investigated the psychometric properties and factor structure of impulsivity, using a number of performance measures. These tasks included; card playing, delay of gratification, circle tracing, go/no-go task with/without a reward condition, stroop, and a delay task. Factor analysis yielded two major factors, which the authors defined as cognitive impulsivity (inhibitory control), and motivational impulsivity (insensitivity to punishment/non-reward). A major limitation of this study lies in the reported psychometric properties of the measures used, only 31% of which met accepted standard for temporal stability or test-retest reliability.

Dolan and Fullam (2004) found low or non-significant correlations between self-report psychometric measures (Antisocial Personality Questionnaire (APQ, Blackburn & Fawcett, 1999), the Impulsivity-Venturesomeness-Empathy Inventory

(IVE, Eysenck & Eysenck, 1985), the BIS-11 (Patton et al., 1995)) and behavioural measures ((STOP, Rubia et al., 2001), Go/no-go (Rubia et al., 1999), Card Playing Task (Newman, Patterson, & Kosson, 1987), and Delay of Gratification task (Newman, Kosson, & Patterson, 1992)) of impulsivity, in a adult male personality disordered sample, detained in a maximum-security hospital. The self-report measures were found to be highly intercorrelated, however no significant intercorrelations were found between the behavioural tasks after controlling for the effect of intelligence. This is particularly surprising as two of the behavioural tasks used (go/no-go and the STOP tasks), were theoretically measuring exactly the same concept, that is, behavioural restraint.

Avila and Parcet (2001), using a female undergraduate sample, compared different self-report measures of personality, including the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ, Torrubia, Avila, Molto, & Caseras, 2001), the EPQ (Eysenck & Eysenck, 1975) and the State Trait Anxiety Inventory (STAI, Spielberger, Gorsuch, & Lushene, 1970), with a behavioural go/no-go task. They found that higher scores on the Sensitivity to Reward scale, and lower scores on the Sensitivity to Punishment, were correlated with inhibitory deficits in the go/no-go tasks. None of the other personality measures were found to significantly correlate with the go/no-go task. They concluded that the EPQ may not be sensitive to the inhibitory control component of impulsivity, as measured by the go/no-go task. It should be noted that they used the extraversion scale of the EPQ that included the sociability, but not the impulsivity items of the original Eysenck Personality Inventory. It is possible that these latter items may be more related to inhibitory control (Logan, Schachar, & Tannock, 1997).

Gorlyn, Keilp, Tryon and Mann (2005) argued that by using experimental performance measures of impulsivity, researchers may only be assessing narrow definitions of the components of the impulsivity trait. They hypothesised that different behavioural tasks would be correlated with different components of impulsivity, as measured by the second order factors of the BIS-11 (Attentional Impulsiveness, Motor Impulsiveness, and Non-planning Impulsiveness). Support for this hypothesis came from the finding that Motor Inhibition (as measured by a Stop-Signal task) was significantly correlated with Motor Impulsiveness of the BIS-11, and Response Organisation (as measured by a Complex Reaction Time task) was significantly

correlated with the Non-planning Impulsiveness factor of the BIS-11. However, this study had a restricted view of impulsivity, due to the comparisons being based solely on the components of a single scale, namely the BIS-11. Results from studies have shown that a number of psychometric and behavioural measures of impulsivity have not significantly correlated with the BIS-11 (Dolan & Fullam, 2004; Helmers, Young, & Pihl, 1995), indicating that this measure does not encompass all components of impulsivity.

Schmidt (2003) commented that the advantage of behavioural measures of impulsivity over self-report measures is that they assess actual specific behaviours. Conversely, items on self-report measures of impulsivity may be endorsed even if a particular statement is not true for the individual. He described an example of this reporting error occurring when a shy person endorses an item regarding use of alcohol or substances. The reasons for the person's use of substances may be to make them feel more confident and less inhibited, and may be quite unrelated to impulsivity. In addition, problems have been identified with behavioural measures of impulsivity. Behavioural tasks are conducted within an artificial environment, and therefore, it cannot be guaranteed that the elements found in these environments replicate real world situations. Schmidt (2003) argued that many of these behavioural tasks may be measuring 'state impulsiveness' (how the individual will respond given a prescribed set of circumstances), rather than more characteristic 'trait impulsiveness' (how the individual responds over a set period of time in different situations).

In summary, there is a lot of confusion and debate about the definition and measurement of the impulsivity construct. Research has returned mixed and inconsistent results, with studies finding correlations between psychometric and behavioural measures of impulsivity, intermittently in different populations. Taken together, this research lends support for a multi-component structure of impulsivity (Evenden, 1999; Reynolds et al., 2006), including Dawe and colleagues (Dawe et al., 2004) two component structure of 'rash impulsivity' and 'reward sensitivity' (Avila, 2001; Kindlon et al., 1995), as mentioned previously. A further suggestion is that these different types of measures actually focus on distinct aspects, with behavioural measures tapping into a 'state-like' aspect, and psychometric measures tapping into a 'trait-like' aspect of the construct (Schmidt, 2003). Although, there are still many questions to be answered, the current status of the psychological research supports the

idea that impulsivity is multifactorial. As such, it is a priority for future research to investigate the factor structure of impulsivity amongst substance users using multimodal measures, as well as using theory-driven research (Evenden, 1999; Miller et al., 2004).

Neuroticism/Negative Affectivity/Negative Emotionality and Substance Use

Historically, the concept of neuroticism, defined as a predisposition to frequently experience negative feelings (Carver & Scheier, 1992), has been based on factor analyses of common adjectives used to describe certain behaviours (Ormel, Rosmalen, & Farmer, 2004). The empirical findings related to the link between neuroticism, and related constructs, with substance use are less consistent than these relating to impulsivity. While some studies have identified neuroticism as an important risk factor for the development of problem drinking, substance use and dependence in adult samples (O'Connor, Berry, Morrison, & Brown, 1995; Sher et al., 1991), as well as tobacco, alcohol and cannabis use amongst adolescents (Johnson & Pandina, 1993; Krueger, 1999; Labouvie, Pandina, White, & Johnson, 1990; Prescott, Neale, Corey, & Kendler, 1997; Sher et al., 2000), other research has found no such relationship (Kashdan, Vetter, & Collins, 2005; McCormick et al., 1998; McGue, Slutske, & Iacono, 1999).

Much of the research in the area is cross-sectional. Kruegar (1999) described a rare prospective longitudinal study of a New Zealand birth cohort that investigated the relationship between personality traits, as measured by the Multidimensional Personality Questionnaire (MPQ, Tellegen, 1982), and a number of psychological disorders, including SUD. With regard to substance dependence, they found that high Negative Emotionality, as measured at age 18, was linked to increased substance dependence at age 21. This relationship remained significant after controlling for other psychological disorders as assessed at age 18.

A cross-sectional study, specifically investigating alcohol use disorders (AUD), has shown a significant relationship between Neuroticism/Negative Affectivity and AUD (Sher et al., 2000), as measured by both the EPQ (Eysenck & Eysenck, 1975) and TPQ (Cloninger et al., 1991). Byrne (1994) found a significant relationship between high scores on Neuroticism, as measured by the adolescent version of the EPQ (Eysenck & Eysenck, 1981), and the level of cigarette smoking in

adolescents, with higher levels of Neuroticism predisposing adolescents to smoking behaviour.

However, many studies have failed to find a direct relationship between substance use and neuroticism, and mixed results have emerged for different drug types, alongside of gender specific effects. McCormick, Dowd, Quirk and Zegarra (1998) found that level of neuroticism was associated with type of drug used; specifically, alcohol users and polysubstance users were found to display higher levels of neuroticism when compared with other drug using groups. Negative Affectivity (NA), as measured by the Neuroticism scale on the NEO-Personality Inventory (NEO-PI, Costa & McCrae, 1985) was found to be associated with greater illicit substance use, but not alcohol use or smoking (Kashdan et al., 2005). Using the EPQ (Eysenck & Eysenck, 1975), Trull et al. (2004) found that personality traits characterized by NA were most highly related to alcohol and drug diagnoses. This association was not supported for tobacco dependence, when other personality disorder traits were controlled for. In other studies, high levels of neuroticism was associated with increased drug use, but only for individuals who were associating with peers that had a high delinquency rate (Shoal & Giancola, 2003), and showed low constraint (Krueger et al., 1994; Sher & Trull, 1994; Shoal & Giancola, 2003; Trull & Sher, 1994).

McGue et al. (1999) when investigating personality differences between a community-based sample of individuals with, and without, a SUD, found that if other substance use disorders were controlled for, the differences between alcoholic and non-alcoholic individuals were primarily on Negative Emotionality, as assessed by the MPQ (Tellegen, 1982). In a review on alcoholism and personality, Mulder (2002) concluded that individuals with high neuroticism/negative emotionality were the most vulnerable to alcoholism, particularly in clinical populations. It was suggested that, for men, most of this association might be secondary to the effects of the alcohol itself. In women, there is evidence that suggests high negative emotionality may predate the onset of alcoholism (Byrne et al., 1994; Khan, Jacobson, Gardner, Prescott, & Kendler, 2005), with some longitudinal evidence suggesting that women who are higher in negative emotionality may be predisposed to alcohol disorders (Jones, 1971).

Other studies have found no association of neuroticism with substance use, when other mediating factors were controlled for. In Knyazev (2004) Neuroticism, as assessed using the EPQ (Eysenck & Eysenck, 1975), showed a weak effect for substance use only in females, and this relationship was mediated by Subjective Well-being (Diener & Suh, 1997) and Conflicts with Adults (Knyazev, 2004). Using the revised NEO-PI (NEO-PI-R, Costa & McCrae, 1992), Flory et al. (2002), when investigating alcohol and marijuana use, failed to find any association between neuroticism and substance use. A difference with this study was the use of a community sample. Given that much of the current research have used clinical populations, this result raises questions about the generalisability of these findings.

In a community sample of non-alcoholic women, Grau and Ortet (1999) found a very low correlation between frequency of alcohol use and anxiety-related traits (including neuroticism). This is consistent with the notion that neuroticism is only a significant factor in substance use for clinical or 'heavy use' populations, including pathological drinkers (Chinnian, Taylor, Al-Subaie, & Sugumar, 1994; King, Errico, & Parsons, 1995). These results may be interpreted as support for the view that neuroticism is a consequence of AUD, as a way to avoid the negative consequences associated with alcohol dependence (Cloninger, Sigvardsson, Przybeck, & Svarkic, 1995), rather than a causal influence. As such, questions remain about the role of neuroticism in the aetiology of substance use disorders (Sher, Trull, Bartholow, & Vieth, 1999).

In an effort to explain these inconsistent results, Verheul and Van Den Brink (2000; 2005) described a number of different pathways to the formation of a SUD. Specifically, a stress reduction pathway was identified as the mechanism by which neuroticism influences SUD's. This model predicted that individuals scoring high on traits such as negative emotionality and anxiety sensitivity were vulnerable to stressful events, and may respond by using substances as a form of self-medication. The results from longitudinal studies have provided support for this model, including Cloninger and colleagues (1988) and Caspi and colleagues (1997) findings that teachers' ratings of negative emotionality, stress reactivity, and high harm avoidance in children predicted substance abuse in adolescence and young adulthood.

Neuroticism, like impulsivity, has been subject to criticism on methodological and theoretical grounds (Ormel et al., 2004; Zelenski & Larsen, 1999). It has been

suggested that the construct of neuroticism in its current form is not sufficient to explain the vulnerabilities or the underlying psychological and biological mechanisms involved (Ormel et al., 2004), particularly as the construct was formed via factor analytic studies of a number of descriptives, and not based on a theoretical model (Carver & Scheier, 1992; Ormel et al., 2004). Criticisms of the measurement of neuroticism include: the lack of a well-defined time frame in most measures; the vague qualifiers of frequency (i.e. sometimes, often, easily, rarely, too often); belief that the general nature of the questions are an invitation to complain; and the view that many of the features overlap with the symptoms of anxiety and depression (Ormel et al., 2004).

In summary, although many studies have found the personality traits of neuroticism and impulsivity to be important predictors of problematic substance use, there is a great deal of inconsistency in the literature. The lack of theory-driven research and inconsistent or inaccurate measurement of these constructs is likely to have contributed to the contradictory nature of these findings. In an attempt to explain some of this inconsistency in the literature, initial studies have highlighted that there may be distinct pathways, and interactions between given factors or events in a person's life that influence the development of SUD (Verheul & van den Brink, 2005).

Coping and Affect Regulation in Substance Use

It is important to stress that personality traits, such as neuroticism and impulsivity, do not operate in isolation, but interact with other risk and protective factors to produce substance use problems (Hasking, 2006; Loukas, Krull, Chassin, & Carle, 2000). This includes a person's coping strategies and their interactions with affect. Lazarus (1966) has defined coping as the response to a specific event or situation that has been perceived as a threat. The ways that individuals cope with stressful situations can be important predictors of their emotional reactions and affect regulation (Carver & Scheier, 1994; Lazarus & Folkman, 1984). These coping responses may have both the desired effect of reducing or getting rid of the perceived threat, or alternatively, they can have a negative effect, and actually interfere with any possible positive outcomes.

There are a large number of different strategies that individuals draw on in order to cope with life stress, and these have been categorised in a number of different ways, based on both theory and observational studies. Carver, Scheier and Weintraub (1989) categorised coping strategies as adaptive and maladaptive. Adaptive strategies include those that are seen as active or problem-focused and involve the individual taking active steps to remove the problem, or at least reduce its effects. Maladaptive strategies are more passive responses, characterised by distraction or disengagement from the stressor as a way of reducing its effect.

Folkman and Lazarus (1984) separated coping strategies based on their specific function. They differentiated emotion-focused coping, which involves the regulation of distressing emotions, from problem-focused coping, which involves actively doing something to change the problem that is causing the distress. In the development of a different coping measure based on an extension of the above definitions, Endler and Parker (1999) conceptualised problem-focused coping as having a *task* orientation, and emotion-focused coping as having a *person* orientation. Based on empirical research (Endler & Parker, 1990; Endler & Parker, 1994), the authors added a third category aimed at avoiding the stressful situation, which they named avoidance coping. They noted that avoidance coping can be either task oriented, such as distracting oneself with other situations, or person oriented, such as social diversion.

Intrapersonal resources available to the individual, such as coping style have been linked to an increased risk of substance use in studies of adolescents (Eftekhari, Turner, & Larimer, 2004; Galaif, Sussman, Chou, & Wills, 2003; Nower, Derevensky, & Gupta, 2004) and adults (Cooper, Russell, & George, 1988; Wills & Hirky, 1996). Specifically, the stress-coping model of substance use posits that, as a reaction to perceived stress, the different types of coping strategies that an individual uses may decrease or increase the risk of substance use, when certain vulnerability factors are present (Wills & Hirky, 1996).

Adolescents who rely more on avoidant coping strategies have been shown to be at a higher risk for developing substance use problems (Labouvie, 1986, 1987; Wagner, Myers, & McIninch, 1999; Wills, 1986; Wills, McNamara, Vaccaro, & Hirky, 1996). Continued use of avoidant coping response into adulthood have been shown to assist in maintaining the substance use behaviours (Cronkite & Moos, 1984,

as cited in Eftekhari et al., 2004; Wills & Hirky, 1996). Research conducted with adult populations have found that when individuals relied more on approach or task-oriented coping, and less on avoidance coping, they were less likely to develop substance use problems (Cooper et al., 1988). However, if substance use problems did develop, individuals who relied more on approach or task-oriented coping, and less on avoidance coping experienced greater success in recovery attempts (Finney & Moos, 1995).

Affect regulation theories of substance use (Cooper, Frone, Russell, & Mudar, 1995) describe substance use itself as a coping strategy. Substances may be used as a direct method of distracting the individual from their problems (Wills & Hirky, 1996), or indirectly, as a way of changing the individual's affect. Using substances to cope with negative affect, an avoidant coping strategy, has been shown to be a robust predictor of problem alcohol use, over and above other drinking motives (Carey & Carey, 1995; Carpenter & Hasin, 1998; Cooper et al., 1988; Cooper, Russell, Skinner, Frone, & Mudar, 1992; Smith, Abbey, & Scott, 1993), and has been implicated with illicit drug problems (Barnea, Teichman, & Rahav, 1993; Neighbors, Kempton, & Forehand, 1992). Over time, continued use of avoidant strategies as a direct and quick way to cope with one's emotional distress, may encourage the person to continue to seek this path as an attempt to restore affective balance (Westen, 1994), thereby exacerbating adjustment difficulties (Aldwin & Revenson, 1987) and reducing opportunities for the development and practice of alternative active solutions to managing their distress.

In addition, affect regulation theories hypothesise that people use substances as a means of increasing positive emotional experiences, termed enhancement motives (Cooper, 1994). A number of studies have demonstrated a significant relationship between the use of substances with the motivation to increase positive emotions (Cooper, 1994; Cooper et al., 2000; Read, Wood, Kahler, Maddock, & Palfai, 2003; Stewart, Zeitlin, & Samoluk, 1996).

A core problem with the research on coping strategies is the variety of different measures that have been used, with the result that the same coping strategy can be grouped in a number of different ways. For instance, the coping strategy of avoiding a problem task by doing another active task, (for example, doing exercise), can either be categorised as an avoidance, maladaptive, emotion-focused or task-

oriented coping strategy. This leads to problems when interpreting results across the different studies.

In summary, although there are a number of issues regarding the categorising of coping strategies, it is still apparent that an individual's coping resources can play a significant role in the development and maintenance of SUD's. It has been shown that individuals use substance as a way to cope with negative emotions, as a way of masking their feelings, and to enhance positive affect. Increasing the range of coping resources has been a component of a number of successful treatment programs (Monti, Kadden, Rohsenow, Cooney, & Abrams, 2002). It is important that the coping and affect regulation risk factors are incorporated into a theoretical model for substance use in order to understand how a SUD develops.

Motives for Substance Use

As highlighted in the previous section, individuals differ in their reasons for substance use. These reasons are important, as different motives for use have been shown to predict discrete patterns of substance use, and substance use problems (Cooper et al., 1992). A recent review on motives for alcohol use (Kuntsche, Knibbe, Gmel, & Engels, 2005) highlighted that much of the research in this area has been based on Cox and Klinger's (1988) model of alcohol use. In this model, motives are defined by the outcome of use (positive or negative) and the situation (internal or external). This resulted in four different groups of motives for drinking, namely coping (internal, negative), enhancement (internal, positive), social (external, positive) and conformity (external, negative). Cooper (1992) developed the Drinking Motives Questionnaire (DMQ) to assess motives for use based on this model.

From this review (Kuntsche et al., 2005), it was shown that social motives were the most commonly reported reason for drinking, with 80% to 94% of participants from the studies reviewed endorsing these reasons (Jerez & Coviello, 1998; Kairouz, Gliksman, Demers, & Adlaf, 2002; Plant, Bagnall, & Foster, 1990). Across the studies, enhancement motives were found to be associated with heavy drinking patterns, and coping motives associated with problem drinking (Cooper et al., 1995; McNally, Palfai, Levine, & Moore, 2003; Simons, Correia, & Carey, 2000). This trend towards specificity in the investigation of motives for use is present in the alcohol field, however, less research has been conducted to validate these findings and

theories with other drugs of abuse. A recent study, comparing different drug types, has found both some divergence and some convergence between motives for alcohol and other drugs, with social motives endorsed more for alcohol use, and coping and conformity motives endorsed equally across all drug types (Simons, Gaher, Correia, Hansen, & Christopher, 2005).

Teter, McCabe, Cranford, Boyd and Guthrie (2005), when investigating a undergraduate population of 9,161 individuals, found that the primary motive given for using stimulants was to help with concentration, to increase alertness and to get high – all forms of enhancement motives. This result differs from those for alcohol use, where the main motives for use were social in nature. As the finding was obtained solely from an undergraduate population, it may not generalise to other populations. Limitations of research in this area include the use of small college sample sizes, and the limited range of drug comparisons (i.e. only marijuana and alcohol), ignoring many other drugs of abuse. These shortcomings make generalising findings to other drugs and populations difficult.

In summary, empirical studies have found that some motives for drug use do generalise across different drug types, however there are indications, also, that different motives are present depending on the drug that is used (Simons et al., 2000; Simons et al., 2005; Teter et al., 2005). Most of this research has been conducted comparing marijuana and alcohol, thus, more research needs to be done to help clarify the different motives for substance use with respect to drug type.

Interactions between Established Risk Factors

Although the risk factors of personality, coping strategies, motives for use, and affect, and substance use have not been explored in a single study, some interactions have been investigated (Cooper et al., 2000; Cooper et al., 1995; Hasking, 2006; Loukas et al., 2000; McCormick et al., 1998). In a sample of 406 community-dwelling normal adults, McCrae and Costa (1986) found that the personality variables of Neuroticism and Extraversion, as measured by the NEO-PI (Costa & McCrae, 1985), correlated significantly with some coping strategies, as measured with an inventory derived from the Ways of Coping Questionnaire (WOCQ, Lazarus & Folkman, 1984). They found that Neuroticism correlated positively with withdrawal, escapist and hostile coping strategies, but correlated negatively with the strategy, drawing strength

from adversity. Extraversion correlated positively with positive thinking, rational action, and gaining strength from adversity coping strategies.

Also using the NEO-PI (Costa & McCrae, 1985) and the WOCQ (Lazarus & Folkman, 1984), McCormick et al. (1998) reported a similar pattern of findings between personality and coping strategies, in a sample of 2,676 patients receiving treatment at a substance abuse centre. They found that Neuroticism was positively associated with escape and avoidance coping, but negatively associated with positive reappraisal. Extraversion was positively associated with positive thinking, rational action, seeking social support and problem solving. In respect to effectiveness of these coping strategies, McCormick et al. (1998) found that individuals high on Neuroticism favoured the coping resources that had been previously judged to be ineffective for reducing distress and helping with problem solving (McCrae & Costa, 1986).

Hasking (2006) investigated the relationships between Gray's (1970; 1981) personality traits, as measured by the Carver and White (1994) BIS/BAS scales, coping strategies, and drinking behaviours in an adolescent sample. The Adolescent Coping Scale (ACS, Frydenberg & Lewis, 1993) was used, a measure that separates coping strategies into problem solving, reference to others and non-productive coping. Contrary to previous research (Franken, 2002; Loxton & Dawe, 2001), no relationship was found between Gray's personality traits and drinking behaviour. The only significant association found was the negative correlation between problem solving coping strategies and drinking behaviour.

A significant body of research within the substance use literature has highlighted interactions between personality variables, and motives for substance use (Finn, Sharkansky, Brandt, & Turcotte, 2000; Read & O'Connor, 2006). Cox and Klinger's (1988) model attempted to take into account these interactions. They hypothesised that mood, or mood-expectancies had an effect on an individual's motive for drinking, which in turn played a significant role in a person's decision to drink. Based on this model, they proposed that the final common pathway to drinking is motivation, and they argued that it is important to determine what specific factors motivate each particular person to drink. However, they acknowledged that there are a variety of other factors that impact on the final decision, and personality has been named as one of these.

Loukas, Krull, Chassin and Carle (2000) investigated alcohol use and motives for use in 337 young adults of alcoholic parents from a longitudinal study of parental alcoholism. They found that individuals high in Neuroticism, as measured by NEO Five Factor Inventory (NEO-FFI, Costa & McCrae, 1992), reported increased coping motives for use, while individuals low in conscientiousness reported both stronger coping motives and stronger enhancement motives, as measured by Cooper's (1994) DMQ.

Cooper, Frone, Russell and Mudar (1995) found that coping motives mediated the association of negative emotions and tension reduction expectancies in relation to the amount of alcohol consumed, and that enhancement motives mediated the association of sensation-seeking and enhancement expectancies on alcohol involvement. Motives were assessed using the DMQ, and Sensation-Seeking was measured with a scale developed by Bernstein and colleagues (1989), which is conceptually similar to Zuckerman's Sensation-Seeking Scale (SSS, Zuckerman, 1979). Read and colleagues (2003) sought to extend Cooper et al.'s (1995) study by testing the associations in a different population (that is, college students), and by adding a social motives scale (derived from the DMQ), seen as particularly relevant to college students. They found that impulsivity, as measured by the SSS, was indirectly associated with alcohol use, with enhancement motives proving the mediating factor. Negative affect and tension reduction expectancies were associated with coping motives in individuals with alcohol problems, but not alcohol use. In this study, social and enhancement motives significantly overlapped and the authors questioned whether these two motives should be differentiated in a college-aged population.

Cooper, Agocha and Sheldon (2000) hypothesised that personality was closely linked to the experience of both positive and negative affect. As such, they investigated the interactions of personality, motives and affect with regards to participating in risky behaviours, operationalised as alcohol use and risky sexual behaviour. They predicted that while individuals high in neuroticism and extraversion would report higher levels of risky behaviours, the underlying motives would be different, with neurotic individuals engaging in risky behaviours to cope with negative emotions, and extraverts engaging in risk behaviours to enhance positive emotions.

Their sample consisted of 1,666 adolescents, randomly selected from a community population. Neuroticism was assessed with a composite of Eysenck's

Neuroticism scale (1975), Nolen-Hoeksema's (1991) trait measure of ruminative coping style, and Rosenberg's (1965) self-esteem scale. Extraversion was assessed with a composite of Eysenck's extraversion scale (1975), a measure of social dominance (Bernstein et al., 1989), thrill-seeking (Bernstein et al., 1989), and sensation-seeking (Schafer, Blanchard, & Fals-Stewart, 1994). Personality factors were found to be important predictors of affect regulation, contributing more when explaining alcohol involvement (32% of residual variance), compared with risky sexual behaviour (6% of the residual variance). They concluded from their path analyses, that their findings showed support for different pathways leading to risky behaviours, with neuroticism fuelling the use of risk taking behaviours to regulate negative affect (coping motives), and surgency/extraversion fuelling the use of risky behaviours to enhance positive affect (enhancement motives).

In summary, researchers have argued that internally generated motives, such as enhancement and coping, are more strongly related to specific personality traits (for example, enhancement with extraversion, and coping with neuroticism) and that these in turn are associated with alcohol use across different situations (Cooper et al., 2000; Loukas et al., 2000).

The literature review above confirms that the risk factors of personality, coping, motives for use, and affect have a significant effect on substance use behaviours, and that they do not operate in isolation from one another. Interactions have been found between personality and affect, personality, affect and motives for use, personality and coping, with these interactions all being linked to alcohol use. One limitation of many of the studies reviewed above is the variety of measures that have been used, particularly salient for the personality variables and coping strategies, resulting in uncertainty about whether the different measures are tapping into the same construct. In addition, it is important to note that the research reviewed above, regarding the interactions between risk factors, investigated only alcohol use, and that investigation into these interactions in other substances is needed.

Gray's Theory of Personality

One potential way of beginning to overcome some of the theoretical and methodological problems with the measurement of personality traits, is to draw on a theoretical model, such as Gray's (1970; 1981) model of personality. Gray (1970;

1981; 1987) developed a biologically based model of personality which was based on Eysenck's personality model (1967), and influenced by his own research in animal learning paradigms (Gray & Smith, 1969). Both Eysenck's and Gray's models posit that personality dimensions reflect individual differences in the functioning of the brains systems which control behaviour. However, Gray argued that Eysenck's theory could not account for certain complex behaviour patterns in a single framework, for example, dysthymia and psychopathology, due to the alignment of Eysenck's Extraversion and Neuroticism personality factors (Gray, 1981). In an attempt to account for this and other anomalies, Gray (1970) suggested that the orthogonal Extraversion-Introversion and Neuroticism-Stability axes should be rotated 30º to form two new causally efficient orthogonal dimensions, which he termed 'trait anxiety' (punishment sensitivity) and 'trait impulsivity' (reward sensitivity). Gray, also, suggested that these new personality dimensions were based on underlying neurophysiological structures different to those suggested by Eysenck (1967). A complete review of the development and differences between these two models is beyond the scope of this thesis (see Matthews & Gilliland, 1999).

Gray's (1970; 1981) model of personality, referred to as the Reinforcement Sensitivity Theory (RST), consisted of three neuropsychological systems, that is, the Behavioural Activation System (BAS), the Behavioural Inhibition System (BIS), and the Flight-Fight-Freeze System (FFFS).

Behavioural Activation System (BAS)

Also known as 'trait impulsivity', the BAS is hypothesised to mediate behaviour elicited by rewards, otherwise termed incentive motivation. In animal models, the animal learns to approach, or produce by some other means, the desired event (that is, the reward). Essentially, it is an 'approach' system, where the BAS regulates the experience of positive emotions causing direction towards desired end states, predisposing individuals to reward seeking behaviours and positive affect. The brain pathways that are hypothesised to correspond to this approach system are the dopaminergic projections: (1) from the nucleus A10 via the ventral tegmentum to the ventral striatum (nucleus accumbens); and, (2) from the substantia nigra to the dorsal striatum (Gray, 1987).

BAS relationship to Impulsivity and Substance Use

According to the model, the BAS regulates the experience of positive emotions causing direction towards desired end states, with individuals high in BAS sensitivity seen as more likely to engage in substance use as a way to enhance positive emotions. BAS is related to impulsivity and it has been suggested that global measures of impulsivity can be cautiously used as indicators of BAS, and that although the two constructs display a certain amount of overlap, they are best conceived as separate constructs (Quilty & Oakman, 2004). Consistent with findings regarding the association between impulsivity and substance use, links between BAS and substance use have also been found. Higher BAS scores have been found to be associated with substance abuse and a lifetime history of alcohol problems in a longitudinal follow-up of a school cohort, consisting of 1,803 individuals between the ages of 19 to 21 years (Johnson, Turner, & Iwata, 2003). Also, BAS scores positively correlated with self-reported alcohol use in a cross-sectional study in an Australian community sample of 2,725 adults (Jorm et al., 1999).

Franken and Muris (2006a) investigated the association between BAS and substance use in a sample of 276 undergraduate psychology students using the Carver and White (1994) BAS/BIS measure. They found that the subcomponents of BAS Drive and BAS Fun-seeking were positively correlated with substance use, however, BAS Reward Responsiveness showed no relation to drinking or drug use. Franken, Muris and Georgieva (2006) reported similar findings when comparing a clinical sample of 110 substance users (39 alcoholics, 71 heroin or cocaine addicts), with a group of age matched controls. Substance users' scores were found to be significantly higher in BAS Drive and BAS Fun-seeking, however no difference was found between scores in BAS Reward Responsiveness. BAS, as measured by the Gray-Wilson Personality Questionnaire (Wilson, Barrett, & Gray, 1989), was found to be a significant predictor of substance use, regardless of gender or other measured risk factors, such as peer use, family use, and conflicts with adults (Knyazev, 2004; Knyazev, Slobodskaya, Kharchenko, & Wilson, 2004).

Although, there is substantial evidence that links BAS (trait impulsivity) to substance use, there are also problems associated with the measurement of the BAS, which is in line with similar issues discussed previously about the construct of impulsivity. For instance, although Carver and White's (1994) BIS/BAS scales, and

the Gray-Wilson Personality Questionnaire (1989) are theoretically measuring the same personality trait, findings indicate that the BIS/BAS scales captured more Extraversion, while the Gray-Wilson questionnaire captured more Psychoticism, indicating that they are measuring different aspects of this construct (Knyazev, Slobodskaya, & Wilson, 2004). In addition, the SPSRQ, another widely used scale used to measure BAS, has been shown to load on both 'reward sensitivity' and 'rash impulsivity' factors (Franken & Muris, 2006b).

From the evidence reviewed, it can be concluded that impulsivity has been consistently associated with increased substance use even when different measures are used. Factor analysis conducted with scores from the Sensation-Seeking Scale (Zuckerman, 1979) and the BIS-11 (Patton et al., 1995) found that BAS, as measured with the BIS/BAS scale (Carver & White, 1994), was correlated with the impulsivity subscales of Thrill and Adventure Seeking (SSS-V), Disinhibition (SSS-V), Boredom Susceptibility (SSS-V), Motor and Attentional Impulsivity (BIS-11), but not Experience Seeking (SSS-V), and Non-planning Impulsiveness (BIS-11) (Quilty & Oakman, 2004). This finding, along with results from other factor analytic studies (Caseras et al., 2003; Miller et al., 2004; Zelenski & Larsen, 1999), led Dawe and Loxton (2004) to conclude that that BAS is better conceptualised as "reward sensitivity or drive". Dawe and Loxton (2004) also highlighted the importance of exploring the relationship between the two factors they described in their review, namely 'reward sensitivity' and 'rash impulsivity', within a range of psychopathology, including substance use. Reviewing this literature, Dolan and Fullam (2004) concluded that clarification of the BAS scale, with respect to its relationship with current notions of impulsivity, would be achieved by exploring the relationship between self-report BAS measures, and other psychometric and behavioural measures of impulsivity.

Behavioural Inhibition System (BIS)

Also known as 'trait anxiety', the BIS was originally hypothesised to produce sensitivity to conditioned aversive stimuli in people (Gray, 1970). Essentially, the BIS was considered to be the biological basis of anxiety, and behavioural consequences of BIS activation include; ongoing behaviours bought to a halt, increased attention to the environment, and increased arousal level. The BIS is posited to regulate the experiences of negative emotions and cause movement away from undesired states.

Individuals, with high BIS sensitivity, are seen as responsive to punishment cues and as predisposed to negative affective states and avoidant behaviours. The central brain structure of the BIS is hypothesised to be the septo-hippocampal area, with a number of different brain pathways contributing to the neurophysiology of this system (Gray, 1981).

In a recent revision of the RST, Gray and McNaughton (2000) proposed changes to the role ascribed to the BIS and the FFFS (described below). In the revised model, the BIS is hypothesised to have a more specialised function and is activated only when conflicting goals are present, that is, to assist in resolving conflicts between the approach system (BAS), and the avoidance system (FFFS) (Corr, 2004). As in the initial theory, the BIS inhibits conflicting behaviours and initiates risk assessment. These actions may be subjectively experienced as worry, rumination and a sense of danger (Corr, 2004).

BIS relationship to Neuroticism and Substance Use

As reported above, Gary (1970; 1981) proposed that neuroticism be rotated 30º to form the new personality dimension of the BIS. Not surprisingly, a number of studies have reported significant correlations between these two personality dimensions in adults (Gomez & Gomez, 2005; Pickering, Corr, & Gray, 1999; Torrubia et al., 2001) and adolescents (Muris, Meesters, de Kanter, & Timmerman, 2005; Shatz, 2005), with findings being reported showing significant Pearson correlation coefficient's ranging from .26 to .84. BIS has also been investigated with respect to its role in substance use problems. In a sample of 617 undergraduate psychology students, Taylor and colleagues (2006) reported that individuals displaying high affectivity characteristics, including high negative emotionality (as measured by the MPQ-Brief Form (Patrick, Curtin, & Tellegen, 2002)), and high BIS (as measured by the SPSRQ (Torrubia et al., 2001)) showed elevated drug use problems. Franken and Muris (2006a) found negative associations between BIS and substance use, in a sample of 276 undergraduate psychology students using the Carver and White (1994) BAS/BIS measure. However, the authors noted that these associations were weak (<.17). Using a clinical sample of 110 substance users, Franken and colleagues (2006) reported finding no differences in BIS scores (as measured by Carver and White's (1994) scale) when compared to an age matched control sample. Other studies have found gender differences when examining

associations between the BIS and substance use, with elevated BIS increasing the risk of substance use in males, while acting as a small protective factor in females (i.e. a higher BIS score resulted in less substance use) (Knyazev, 2004; Knyazev, Slobodskaya, Kharchenko et al., 2004).

Therefore, in line with the current literature on neuroticism and substance use, the nature of the association between 'trait anxiety' (or BIS) and alcohol misuse remains unclear, with some studies finding a positive relationship (Brady, Grice, Dustan, & Randall, 1993; Taylor et al., 2006), some finding a negative relationship (Battaglia, Przybeck, Bellodi, & Cloninger, 1996; Franken & Muris, 2006a), and others finding no relationship at all (Franken et al., 2006; Grau & Ortet, 1999).

Flight-Fight-Freeze System (FFFS)

In Gray's original model (Gray, 1970), this system was named the Flight-Fight System (FFS), and was posited to be activated only by unconditioned stimuli. In the revised theory (Gray & McNaughton, 2000), this system is said to be responsible for mediating an individuals' reaction to all aversive stimuli, both conditioned and unconditioned. As a result, this system is seen as responsible for a variety of different avoidance and escape behaviours (Corr, 2004). Importantly, this system is associated with the 'fear' emotion, and is not believed to mediate anxiety.

Evidence for Gray's RST Theory

While much of Gray's early work focused on testing his anxiety model in animal paradigms (Gray, 1978), some of this research also extended to human participants (Gray & Nicholson, 1974; Nicholson & Gray, 1972). Results from these early studies show two types of reactions by participants to certain conditions, with one subset of individuals being particularly sensitive to frustrative non-reward, and a second subset displaying a heightened sensitivity to reward. Since these early experiments Gray's theory has found support in an array of different studies, including studies exploring instrumental conditioning (Avila, 1994; Avila, Parcet, Ortet, & Ibanez-Ribes, 1999), performance tasks (Gomez & Gomez, 2002; Jackson, 2001; McCord & Wakefield, 1981; Nicholson & Gray, 1972) disinhibition tasks (Avila, 2001; Avila & Torrubia, 2004), physiological studies (Bartussek, Diedrich, Naumann, & Collet, 1993; De Pascalis, Fiore, & Sparita, 1996) and induced emotion (Gomez, Cooper, & Gomez, 2000; Larsen & Ketelaar, 1991; Rusting & Larsen,

1997). However, alongside these studies, other investigations returned inconsistent findings that were contrary to predictions arising from Gray's model. These include, high scorers on a BIS measure performing the best in a reward condition (Barratt, 1971; Hagopian & Ollendick, 1994), and failure to replicate the finding that extraverts display increased neural activity in areas of the brain associated with BAS functioning in response to a 'win' condition (De Pascalis et al., 1996).

Specific criticisms of RST include the suggestion that Gray's (1970; 1981) revised personality axes are not better predictive of performance, compared with the original dimensions proposed by Eysenck (Matthews & Gilliland, 1999). It has been argued that Eysenck's model of personality can be generalised to a number of different behaviours, whereas Gray's dimensions are said to lack this generalisation with the latter model referring only to behavioural reactions to very specific cues (Pickering, Diaz, & Gray, 1995; Zinbarg & Revelle, 1989). As a general criticism of the biological approach to personality, Matthews and Gilliland (1999) have argued that these approaches may need to be entirely reassessed, and that a cognitive or social approach may be more effective. A comprehensive review of the theory is beyond the scope of this thesis, but for interested readers see Corr's (2004) review on the current status of RST and personality.

RST, the Brain and Substance Use

The hypothesised underlying neural structures of the BAS (Dawe & Loxton, 2004; Gray, 1987, 1990) are the same critical pathways responsible for the brain's reward processes and reinforcing effects (Martin-Soelch et al., 2001). Based on the RST, Hewig, Hagemann, Seifert, Naumann and Bartussek (2005) conducted an investigation into cortical activity, with the aim of examining the reinforcing properties of BIS and BAS relevant stimuli using a go/no-go task, with and without monetary reward. As hypothesised, subjects showed better performance on the conditions with positive reinforcement, as compared with the neutral control. With respect to RST, subjects with high BAS scores additionally showed increased bilateral frontal cortical activity in response to positive reinforcement cues. The authors reported, also, that high BIS subjects demonstrated decreased frontal activity in these same regions in response to passive avoidance cues.

Hewig and others (2005) concluded that their findings supported the notion that high BAS participants showed increased frontal cortical activity in response to positive reinforcement or reward. Additionally, based on evidence from previous research (Nieuwenhuys, 1985; Rolls, 1999), they suggested that dopaminergic projections might be directly involved with this cortical activity. These findings, taken together with previous evidence supporting dopamine's role in substance abuse, raise important questions about the involvement of neural activity and neurotransmitters and their role in the development in SUD. While this research is promising, there are a number of limitations, including the small sample size (n=38), and the possibly of confounded results from the go/no-go task, with the detected differences being due to differences in motor activity, rather than in BAS/BIS levels. Manipulating the amount of reinforcement, and investigating the effects of these manipulations on cortical activity, would be an improvement for future studies. If an increase in cortical activity was shown to be in similar proportions to the amount of positive reinforcement given, it would demonstrate increased support for the notion that individuals with high BAS were reacting to positive reinforcement, regardless of differences in motor activity.

The Current Study

Excessive substance use has been shown to be associated with numerous negative outcomes, including criminal involvement, violence, markedly increased health costs, and community, family and personal distress (Proudfoot & Teesson, 2002). Initiation of substance use commonly occurs in adolescence and young adults (Australian Institute of Health and Welfare, 2005), and early onset substance use has been shown to be related to more substance use problems (Wills et al., 2000). To date a large number of risk and protective factors for substance use have been identified, but there is a noticeable lack of theory-driven research and little effort has been made to integrate these findings into a developmental model of substance use. This study aimed to explore the relationship between substance use in young people and four established risk factors, including personality, coping strategies, motives for use, and affect using multimodal assessments and a biological theory of personality (RST).

Study One examined the relationship between substance use and the established risk factors of personality, specifically the BIS (trait anxiety) and BAS (trait impulsivity) dimensions in Gray's (1970; 1981) model of personality (RST);

emotion-oriented, avoidance and task-oriented coping strategies; coping, enhancement and social motives for substance use, and positive and negative affect in a sample of young substance users. Firstly, young substance users' performances on measures of these risk factors were compared to general population norms to assist in exploring characteristics of the current sample. Where differences were found in the norms between males and females, scores were analysed separately with respect to gender. By demonstrating that the characteristics of the current sample were similar to other substance using populations, the validity of generalising any conclusions reached from this sample would increase. The influence of, BIS (trait anxiety), BAS (trait impulsivity), coping strategies, motives for substance use and affect on severity of substance dependence and frequency of substance use, was examined in this clinical sample of young people. As highlighted previously, studies have indicated the presence of gender specific effects on drug use (Byrne, Byrne, & Reinhart, 1995; Khan et al., 2005; Knyazev, 2004; Knyazev, Slobodskaya, Kharchenko et al., 2004), and therefore gender was taken into account when examining these risk factors.

Study Two focused more specifically on the measurement and structure of the construct of impulsivity. It aimed to examine the convergent validity between self-report and neuropsychological measures of 'rash impulsivity' and 'reward sensitivity' in a sub-sample of adolescent substance users, whilst controlling for attention and executive functioning factors. The hypotheses for Study One and Study Two are detailed below.

Hypotheses

Study One

1) Comparison with population norms. It was hypothesised that when compared with a normative population, regardless of gender:

    a. The scores on measures of BAS (trait impulsivity) and BIS (trait anxiety) will be elevated in the substance using sample.

    b. Emotion-oriented and avoidant coping scores will be elevated, and task-oriented coping scores will be lower in the substance using sample.

    c. Enhancement, social and coping motive scores for substance use will be significantly higher in the substance using sample.

d. Scores on measures of negative affect will be elevated, and scores on a measure of positive affect will be lower in the substance using sample.

2) Relationships between risk factors and substance use behaviours, controlling for gender effects. It is hypothesised that:

   a. Higher scores on measures of BAS (trait impulsivity), emotion-oriented coping, enhancement motives and positive affect will be predictive of more frequent substance use and more severe substance dependence.

   b. Higher scores on measures of BIS (trait anxiety), avoidant coping, coping motives and negative affect will be predictive of more frequent substance use and more severe substance dependence.

3) Predictors of Substance Use Behaviours

An additional aim of this research was to investigate the relationships between the measured risk factors and substance use behaviours. Due to the exploratory nature of this research, no specific hypotheses were made. Analyses, based on correlational findings, were undertaken to investigate which risk factors were best predictive of substance use behaviours (measured by frequency of substance use, and scores on substance dependence scales).

Study Two

2. Relationship between self-report and neuropsychological measures of 'rash impulsivity' and 'reward sensitivity'. It was hypothesised that, when controlling for attention and executive functioning factors,:
   a. The self-report measure of 'rash impulsivity' (as measured by the BIS-11) will be predictive of go/no-go performance under neutral conditions.
   b. The self-report measure of 'reward sensitivity' (as measured by the SPSRQ) will be predictive of go/no-go performance under reward conditions.
   c. The self-report measure of 'reward sensitivity' (as measured by the SPSRQ) will be predictive of scores on the DDT.
   d. The two behavioural measures of 'reward sensitivity', namely the DDT and the go/no-go performance under reward conditions, will be significantly positively correlated.

CHAPTER TWO
STUDY ONE

Introduction

Excessive substance use has been shown to be associated with numerous negative outcomes, (Proudfoot & Teesson, 2002), with younger age groups demonstrating a higher risk for alcohol and drug related harm (Australian Institute of Health and Welfare, 2005). To date, while a large number of risk and protective factors for substance use have been identified, there is a noticeable lack of theory-driven research, with little effort being made to integrate findings into a model of substance use. Accordingly, using a sample of young substance users, Study One examined the relationship between substance use and the established risk factors of personality, specifically the BIS (trait anxiety) and BAS (trait impulsivity) dimensions in Gray's (1970; 1981) model of personality (RST), as well as emotion-oriented, avoidance and task-oriented coping strategies, coping, enhancement and social motives for substance use, and positive and negative affect.

The hypotheses for the current study are:

1. Comparison with population norms. It was hypothesised that when compared with a normative population, regardless of gender:

    e. The scores on measures of BAS (trait impulsivity) and BIS (trait anxiety) will be elevated in the substance using sample.

    f. Emotion-oriented and avoidant coping scores will be elevated, and task-oriented coping scores will be lower in the substance using sample.

    g. Enhancement, social and coping motive scores for substance use will be significantly higher in the substance using sample.

    h. Scores on measures of negative affect will be elevated, and scores on a measure of positive affect will be lower in the substance using sample.

3. Relationships between risk factors and substance use behaviours controlling for gender effects. It is hypothesised that:

c. Higher scores on measures of BAS (trait impulsivity), emotion-oriented coping, enhancement motives and positive affect will be predictive of more frequent substance use and more severe substance dependence.

d. Higher scores on measures of BIS (trait anxiety), avoidant coping, coping motives and negative affect will be predictive of more frequent substance use and more severe substance dependence.

4. Predictors of Substance Use Behaviours

An additional aim of this research was to investigate the relationships between the measured risk factors and substance use behaviours. Due to the exploratory nature of this research, no specific hypotheses were proposed. Analyses based on correlational findings, were undertaken to investigate which combinations of risk factors were best predictive of substance use behaviours (measured by frequency of substance use, and scores on substance dependence scales).

Method

Sample

Participants were 119 young substance users, who were aged between 16 and 30 years with a mean age of 21.4 years (S.D. = 3.09). Of these participants, 67 (56.3%) were males, and 52 (43.7%) were females. The participants all had a DSM-IV (American Psychiatric Association, 2000) SUD diagnosis of abuse or dependence for at least one type of substance. Of this sample, 22.7% (n=27) had three or more current SUD diagnoses, and 72.3% (n=86) had three or more lifetime SUD diagnoses. The mean age of first drug use was 11.1 years (S.D. = 3.05), while the mean age of self-reported problematic drug use was 14.6 years (S.D. = 2.73).

The majority of the participants were Caucasian (80.7%), with the remaining participants coming from Asian (13.4%), African (2.5%), Middle Eastern (2.5%) or Polynesian backgrounds (0.8%). A high percentage (83.2%) of participants were unemployed, with only 11.8% currently employed and 5% currently attending secondary school. Many of the participants had progressed to secondary education (74.8%) with very few continuing on to complete a university degree (1.7%) or TAFE (2.5%) course.

Sample Recruitment

Young people experiencing problems with substance use were recruited on a voluntary basis from three alcohol and other drug (AOD) agencies in Melbourne including:

1) Drug and Alcohol Services West (DASWest), part of the Western Health network, which covers a catchment area of 1,335 square kilometres, and provides services for 567,640 people situated in the west of Melbourne. Participants were recruited from both the adult and youth detoxification units;
2) Dandenong needle exchange in Southern Melbourne, part of the South East Alcohol and Drug Service (SEADS) of Southern Health, with services covering an area of 2,800 square kilometres, for a population of over 750,000 people living in the Southern region of Melbourne; and
3) Youth Substance Abuse Service (YSAS), which provides a range of youth-specific outreach, treatment, withdrawal, rehabilitation and support programs in a number of locations around Melbourne and regional Victoria. The participating agency used in the current study was based in inner Northern and Western Melbourne.

Details of recruitment sources are shown in Table 1.

Table 1

Recruitment Sources

	n	Percentage (%)
DASWest Adult Unit	40	33.6
DASWest Youth Unit	40	33.6
South East Alcohol and Drug (SEADS)	16	13.4
Youth Substance Abuse Service (YSAS)	23	19.3
Total	119	100.0

Inclusion Criteria

The criteria for inclusion in the study were individuals, aged between 16 and 30 years, attending AOD agencies for the treatment of substance misuse, and able to provide informed consent.

Exclusion Criteria

Individuals were excluded from the study if they had no lifetime SUD, were intoxicated at the time of the interview, had current psychotic symptoms, or were unable to provide informed consent.

Measures

Demographic Questionnaire

A 14-item questionnaire was developed for this study to elicit basic demographic information from the participants including; date of birth, gender, ethnicity, level of education, occupation, living arrangements, family history of psychiatric disturbance, and social support (see Appendix A for copies of all measures used in this study).

Substance Use Measures

Structured Clinical Interview for DSM-IV (SCID-IV, First, Spitzer, Gibbon, & Williams, 2001)

All participants were assessed for the presence of current and past substance abuse or dependence disorders using the Substance Use Disorder section of the SCID-IV Patient Edition (First et al., 2001), which is based on criteria in the DSM-IV (American Psychiatric Association, 2000). The number of current substance use disorders and number of lifetime substance use disorders (incorporating current diagnoses) were recorded. The SCID-IV is the most widely used diagnostic interview and produces highly reliable diagnoses (First et al., 2001) with kappa values for the Axis I disorders range from .70 to 1.00 in adolescent (Martin, Pollock, Bukstein, & Lynch, 2000) and adult populations (First et al., 2001). Kappa values for the SUD section of the SCID-IV range from .82 to 1.00 (Martin et al., 2000).

Timeline Followback (TLFB, Sobell & Sobell, 1992)

Timeline Followback is a method used to retrospectively assess the frequency and quantity of alcohol and other substance use over a 28-day period (4 weeks). The total number of Standard Drinking Units (SDU) was calculated using a standard drink conversion sheet (Drug Info Clearing House, 2003). The number of Standard Cannabis Units (SCU) was defined as ‘cones’. A ‘standard’ cone is approximately 2cm in height and 1cm in diameter, and is a widely recognised measure of cannabis in Australia (Kavanagh & Saunders, 1999).

TLFB methods have well-established reliability and validity for assessing alcohol consumption (Sobell & Sobell, 1996) and have recently demonstrated high temporal reliability, convergent and discriminant validity for illicit drug use (Fals Stewart, O'Farrell, Freitas, McFarlin, & Rutigliano, 2000). Moderate to high test-retest reliability was reported, with intraclass correlation coefficient (ICC) values ranging from .70 to .94 (Fals Stewart et al., 2000; Sobell & Sobell, 1996) and Pearson *r* values ranging from .69 to .99 for the different drug types (Ehrman & Robbins, 1994).

Severity of Dependence Scale (SDS, Gossop et al., 1995)

The SDS is a 5-item measure of an individuals' degree of dependence on their 'drug of choice'. Participants were asked to select what they considered to be their 'most problematic drug' for their 'drug of choice'. Each item was scored on a 4 point scale. For items 1-4, the scale was rated as: '0' = never/almost never, '1' = sometimes, '2' = often and '3' = always/nearly always. The rating scale's categories changed for item 5, a question about the difficulty of ceasing drug use, and were expressed as: '0' = not difficult, '1' = quite difficult, '2' = very difficult and '3' = impossible. The items were then added together to get a total SDS score, with possible scores ranging from 0 to 15. Higher total scores indicate a higher level of dependence.

This measure focuses on the psychological aspects of dependence, and has demonstrated satisfactory levels of internal consistency and validity amongst a variety of addicted populations in both the United Kingdom and Australia (Gossop et al., 1995). Test-retest reliability is adequate, ranging from .69 to .85 on the individual items (Martin, Copeland, Gates, & Gilmour, 2005), and .89 on the total SDS score (Gossop, Best, Marsden, & Strang, 1997). This measure shows good construct validity, as total SDS scores have been shown to be significantly associated with drug taking behavioural patterns, including dose, frequency, and contact with other drug users, with this finding proving consistent across the different drug types (Gossop et al., 1995; Martin et al., 2005). In the current study, the total SDS scores showed adequate reliability, with an alpha coefficient of .66. The drug that participants identified as their 'most problematic drug' were opiates (48.7%), cannabis (28.6%), alcohol (12.6%), stimulants (5.9%), solvents (2.5%), sedatives (.08%), and hallucinogens (.08%).

Personality and Psychological Variables

Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ, Torrubia et al., 2001)

The SPSRQ is a self-report measure designed to assess individual differences in the anxiety or sensitivity to punishment (SP) dimension, and the impulsivity or sensitivity to reward (SR) dimension of Gray's (1970; 1981) neuropsychological model of personality (RST). Participants responded either 'yes' or 'no' to 48 items, 24 of which corresponded to the SP scale, and 24 corresponded to the SR scale. A 'yes' response was assigned a value of '1', and a 'no' response was assigned a value of '0' and was scored according to the procedures developed by Torrubia et al., (2001), by summing the items to obtain the two scale scores.

Both the SP and SR scales have demonstrated good reliability, with internal consistency alpha levels of .81 to .83 and .74 to .78, respectively (O'Connor, Colder, & Hawk, 2004; Torrubia et al., 2001). Adequate test-retest scores have been demonstrated, with alpha coefficients ranging from .87 to .89 over a three month period, and from .69 to .74 after one year (Torrubia et al., 2001). Adequate construct validity has been demonstrated by studying correlations of the scales with other personality dimensions (Torrubia et al., 2001), including the Eysenck Personality Questionnaire (EPQ, Eysenck, Garcia-Sevilla, Torrubia, Avila, & Ortet, 1992) and the State Trait Anxiety Inventory (STAI, Spielberger et al., 1970). In the present study, the SP and SR were found to have adequate reliability, with alpha coefficients of .70 and .67, respectively.

Coping in Stressful Situations (CISS, Endler & Parker, 1999)

The CISS questionnaire is a 48-item self-report measure that asks respondents about how much they engage in specified coping strategies during stressful situations. The questionnaire comprises three different scales, measuring emotion-oriented coping, task-oriented coping and avoidance coping. Participants were asked to respond using a Likert scale ranging from '1' = not at all, '2' = a little bit, '3' = moderately, '4' = quite a bit, and '5' = very much. Each factor contains 16 questions, which are summed to obtain the coping scores for each scale, with total scores ranging from 16 to 80.

This measure has demonstrated good internal consistency with Cronbach's alpha coefficients ranging from .72 to .92, with both adult and adolescent populations

(Endler & Parker, 1999). Test-retest reliabilities were found to be moderate to high, ranging from .51 to .73, with task-oriented and emotion-oriented scales proving the most reliable. Strong support has been found for the construct validity of the scale, with Endler (1999) describing the CISS as a multidimensional instrument that independently assesses the three different methods of coping. In the current study, Cronbach's alpha coefficients were very satisfactory with results of .91 for task-oriented coping, .90 for emotion-oriented coping and .81 for avoidance coping.

Drug Use Motives Measure (DUMM, Mueser, Nishith, Tracy, DeGirolamo, & Molinaro, 1995)

The DUMM assesses reasons for substance use, and provides a four-factor measure of drug use motives, including; coping, conformity, social and enhancement motives. The 20 items of the DUMM were rated on a 5-point Likert scale which was '1' = almost never/never, '2' = some of the time, '3' = half of the time, '4' = most of the time, and '5' = always/almost always, and then summed to obtain each drug use motive score. Total scores range from 0 to 25 for each factor.

This measure was adapted from the Drinking Motives Questionnaire (DMQ, Cooper, 1994), developed originally for use in adolescent populations, and has well established internal consistency and construct validity. Various studies have used the DUMM to explore motives for other drug use, and have reported good internal consistencies with alpha coefficients ranging from .89 to .91 (Simons et al., 2005; Stice, Kirz, & Borbely, 2002). Validity of this measure is demonstrated through the moderate-to-strong correlations with severity of alcohol and drug use problems (Cooper, 1994; Simons et al., 2005). In the current research, internal consistencies, as measured by Cronbach's alpha coefficient, were .83 for enhancement and coping motives, .82 for conformity motives and .89 for social motives.

Positive and Negative Affect Scale (PANAS, Watson, Clark, & Tellegen, 1988)

The PANAS is a brief measure of positive affect (PA) and negative affect (NA), and is comprised of two 10-item mood scales. The 10 descriptives for the positive affect scale includes the adjectives: attentive, interested, alert, excited, enthusiastic, inspired, proud, determined, strong and active. The 10 descriptives for the negative affect scale includes the adjectives: distressed, upset, hostile, irritable, scared, afraid, ashamed, guilty, nervous and jittery. Participants were asked to rate to what extent they had experienced these feelings over the past week. Items were rated

on a 5-point Likert Scale including; ‘1’ = very slightly or not at all, ‘2’ = a little, ‘3’ = moderately, ‘4’ = quite a bit and ‘5’ = very much. The NA and PA scores were obtained by summing the 10 items that comprised each scale, producing scores in the range of 5 to 50.

The scales have demonstrated good internal consistency, with reliability scores ranging from .86 to .90 for PA, and .84 to .87 for NA (Melvin & Molloy, 2000; Watson et al., 1988). Satisfactory discriminant validity was reported, with correlations between the PA and NA scales, ranging from -.12 to -.23. (Watson et al., 1988). In the current study, internal consistencies for PA and NA were .89 and .90, respectively, while adequate discriminant validity was established, with a non-significant correlation of .07 between the two scales.

Mood and Anxiety Symptom Questionnaire – Short Form (MASQ-SF, Clark & Watson, 1991)

The MASQ-SF is a measure of anxiety and depression based on a tripartite model of these disorders, as consisting of three subtypes: general distress (i.e., symptoms experienced by both anxious and depressed individuals), somatic anxiety, and anhedonia. The general distress scale is further separated into non-specific symptoms of depression (e.g. feelings of sadness), and non-specific symptoms of anxiety (e.g. felt nervous), which are considered to be distinctly different, although still having the same underlying construct of negative affect. As the focus of this study was on the underlying mood of participants, only these last two scales were utilised in this study - namely: General Distress: Depressive Symptoms (GDD; 12 items), and General Distress: Anxious Symptoms (GDA; 11 items). Participants were required to use a 5-point Likert scale consisting of ratings ‘1’ = not at all, ‘2’ = a little bit, ‘3’ = moderately, ‘4’ = quite a bit, and ‘5’ = extremely, to indicate how much they had experienced each symptom in the past week. To calculate the GDD score, the 12 items relating to this scale were summed, resulting in possible scores ranging from 5 to 60. The GDA was calculated in a similar manner, with the 11 items that comprised this scale being summed to obtain a possible score ranging from 5 to 55. The higher the total scores the more severe the general distress symptoms.

Watson and colleagues (1995; 1995) provided evidence for the reliability and construct validity of the MASQ subscales, in both adult and adolescent populations. In these psychometric studies, the GDD and GDA factors show alpha coefficients

ranging from .90 to .92 and .78 to .86, respectively. Confirmatory factor analyses, also, have supported the concept of one non-specific factor (i.e., General Distress), consisting of moderately to highly related subsets of anxious and depressed symptoms. The GDD and GDA show high internal reliability in the present study with alpha coefficients of .92 and .85, respectively.

Procedure

Ethical approval to conduct the current research was granted by the North Western Mental Health Research and Ethics Committee (see Appendix B), and the protocol was registered with the University of Melbourne Behavioural and Social Sciences Human Ethics Committee.

Participants were recruited via case managers and posters or information brochures placed in the different referral agencies. Interested individuals either left their name and contact details with the agencies involved or, after discussing the project with their clients, case managers passed the contact details of the consenting individual to the researcher. The researcher then made phone contact with the individual to set up an interview time. Participants were provided with verbal and written information about the study and informed consent was obtained in writing (see Appendix C). All interviews were conducted on the premises of the referral agencies. Two trained postgraduate psychology students administered the interviews and ten percent of the diagnostic interviews were rated by both interviewers for inter-rater reliability purposes. Although there were some differences in the scoring of the individual diagnostic criteria, the interviewers reached identical clinical diagnoses for these ten participants.

The SCID-IV was first administered to participants and followed by the TLFB method, to gain specific information about their substance use over the past month. Participants were then asked to fill in the self-report questionnaires. Each interview took between 60 and 90 minutes to complete. Participants were asked if they would consent to be contacted at a later date for involvement in any future studies. The contact details of these consenting to follow-up were obtained.

Statistical Analyses

The internal consistencies of the self-report measures used in the current study were first determined using Cronbach's alpha. These alpha values have been included

in the measure descriptions. Data was then screened by examining the means, standard deviations and assessing the assumption of normality for each variable. Young substance users' performance on measures of personality, coping, motives for use, and affect measures were first compared to population norms using one-sample *t*-tests to compare the means.

The relationships between personality, coping, motives for substance use and affect variables and substance use behaviours were explored using correlational analyses (Pearson product moment correlations). Hierarchical multiple regression analyses were conducted to explore the predictive power of variables relating to personality, coping, motives for substance use and affect on the severity of substance dependence, the number of lifetime SUD diagnoses, and the frequency/quantity of alcohol and cannabis use. As cited in Chapter One, studies have indicated the presence of gender specific effects of personality on drug use (Byrne et al., 1994; Khan et al., 2005), which highlighted the importance of controlling for gender. In all analyses, substance use measures were entered as the dependent variables, gender was entered as an independent variable at step 1, and personality, coping strategies, motives for use, and affect were entered as independent variables at step 2.

Results

The results from the testing of the hypotheses for Study One are presented in two sections. As described above, the first section presents the results from one sample *t*-tests used to test Hypothesis 1. The second section outlines the results obtained from the analyses undertaken to test Hypothesis 2. A discussion specific to the findings presented in Study One will follow at the end of this chapter.

Data Screening

Most variables met the assumption of normality, based on Tabachnick and Fidell's (2001) equation stating that skewness/standard error ratio should be less than three. However, the total scores obtained on the Enhancement Motives and Coping Motives scales did not meet this assumption, and a reflect and square root transformation was conducted on both of these variables. These transformations resulted in improvements to the distribution of these variables, with the transformed variables being found to be normally distributed using Tabachnick and Fidell's (2001) equation. These new variables were named RSQ_Enh and RSQ_Cop, respectively,

and were included in all further analyses in place of the original variables. Conformity motives did not meet the assumption of normality, and as transforming this variable was unsuccessful in improving this distribution, this variable was not used in any further analyses. Among the substance use outcome measures, the SDS, the standard drinks per day in the month, and the number of SCU in the month all displayed skewed distributions. A square root transformation was conducted on the SDS, and logarithmic transformations were conducted on the remaining skewed variables. Following these transformations the new scores met the assumption of normal distribution and were used in all further analyses. The new variables were named SQ_SDS, LG_DSDU and LG_DSCU, respectively. Summaries of the analyses that were carried out using the non-transformed variables are provided in Appendix D.

The basic summary statistics for the BAS, BIS, coping strategies, motives for use, affect, and substance use variables are displayed in Table 2.

Table 2

Summary Statistics for Variables in Study One

Variables[1]	N	Mean	Range	Standard Deviation	Skewness Statistic	Skewness Standard Error	Kurtosis Statistic	Kurtosis Standard Error
BAS	119	12.87	0-22	3.74	-.44	.22	.42	.44
BIS	119	14.03	2-22	4.05	-.58	.22	-.15	.44
Cop_Task	118	45.08	20-80	11.74	.50	.22	.42	.44
Cop_Emo	118	52.58	25-77	12.50	-.28	.22	-.68	.44
Cop_Avo	119	46.66	27-73	10.44	.27	.22	-.51	.44
Mot_Enh	118	19.54	6-25	4.70	-.74	.22	-.05	.44
Mot_Cop	117	19.63	6-25	4.75	-.70	.22	-.19	.44
Mot_Con	119	9.34	5-25	4.65	1.42	.22	2.14	.44
Mot_Soc	119	16.34	5-25	6.01	-.24	.22	-.97	.44
PA	119	28.51	10-50	8.97	.41	.22	-.48	.44
NA	117	28.64	10-50	9.64	.09	.22	-.56	.44
Anx	117	24.84	9-45	7.61	.12	.22	-.16	.44
Dep	117	33.28	11-55	10.96	.10	.22	-.63	.44
Age_FDU	119	11.14	.5-18	3.05	-.53	.22	.69	.44
Cur_Dia	119	1.87	0-5	.95	.58	.22	.33	.44
Life_Dia	119	3.48	1-5	1.36	-.41	.22	-1.1	.44
SDS	119	11.57	1-15	2.88	-.88	.22	.98	.44
DSDU	119	7.83	0-40	8.86	1.33	.22	1.60	.44
DSCU	119	34.62	0-364	53.21	3.31	.22	14.79	.44

Notes. [1] BAS=Sensitivity to Reward, BIS=Sensitivity to Punishment, Cop_Task=task-oriented coping (CISS), Cop_Emo=emotion-oriented coping (CISS), Cop_Avo=avoidance coping (CISS), Mot_Enh=Enhancement Motives (DUMM), Mot_Cop=Coping motives (DUMM), Mot_Con= Conformity Motives (DUMM), Mot_Soc=Social Motives (DUMM), PA=positive affect (PANAS), NA=negative affect (PANAS), Anx=General Distress: Anxiety (MASQ), Dep=General Distress: Depression (MASQ), Age_FDU=Age of first drug use (incl. cigarettes and alcohol), Cur_Dia=number of current substance use diagnoses as defined by SCID-IV, Life_Dia=number of lifetime substance use diagnoses as defined by SCID-IV, SDS=Substance dependence scale, DSDU=Number of standard drinking units per day in the past month, DSCU=Number of standard cannabis units per day in the past month.

Section 1: Comparison of Personality, Coping Strategies, Motives for Use, and Affect Measures with Normative Data

Young substance users' performance on measures of BAS, BIS, coping strategies, motives for use, and affect, displayed in Table 2, were compared with the normative data for each scale using one-sample *t*-tests.

Personality Scores Compared with Normative Data

The BAS and BIS scores obtained from the current clinical sample were compared with normative data collected in the development of the SPSRQ measure. The normative sample consisted of a number of undergraduates, with a mean age of 19.62 (SD=2.35) and age range of 17 to 40 (Torrubia et al., 2001). The authors noted that data was presented by gender due to differences in scores. Hypothesis 1a predicted that both the BAS and the BIS scores would be elevated in the current sample when compared with the normative sample. As shown in Table 3, the BAS scores for males in the present sample were not significantly higher than for the normative population. Compared with the normative data, the mean BAS score for females was significantly elevated in this substance using sample, with a large effect size. BIS scores were significantly elevated in the current sample, with small and moderate effects sizes being found for males and females, respectively.

Table 3

Comparison of Means Scores on the SPSRQ

Sample		Current Sample		Normative Sample					
Personality		*Mean*	*SD*	*Mean*	*SD*	*t-test*	*df*	*p*	*Cohen's d*
BAS	Male	12.39	4.31	12.18	4.48	.395	66	.694	.05
	Female	13.50	2.79	10.11	4.05	8.76	51	.000	.84
BIS	Male	13.27	4.35	11.65	5.27	3.05	66	.003	.31
	Female	15.02	3.42	11.98	5.06	6.41	51	.000	.60

Coping Scores Compared with Normative Data

The task-oriented, emotion-oriented, and avoidance coping strategies from the substance using clinical sample were compared with the normative data obtained from the CISS measure, based on a normative adult sample of persons aged 18 years and older. As with the SPSRQ, the norms were separated by gender, due to observed gender differences in scores. The results of these comparisons are shown in Table 4. There were a number of significant differences in the mean scores of these two

samples. Consistent with hypothesis 1b, scores were lower in the substance using sample for task-oriented coping for both males and females, with large effect sizes. Also consistent with hypothesis 1b, scores were higher in the current substance using sample on the emotion-oriented coping scale in both males and females, with large effect sizes. Avoidance coping scores were found to be elevated only in males in the substance using sample, with a large effect size. Scores for females in the present study did not differ significantly from those of females in the normative population.

Table 4

Comparison of Mean Scores on the CISS

Sample		Current Sample		Normative Sample					
Coping Strategies		*Mean*	*SD*	*Mean*	*SD*	*t-test*	*df*	*p*	*Cohen's d*
Task	Male	47.18	12.27	58.56	9.95	-7.59	66	.00	-1.09
	Female	42.33	10.50	58.60	8.65	-11.06	50	.00	-1.82
Emotion	Male	49.34	13.18	39.21	11.54	6.29	66	.00	.85
	Female	56.84	10.19	42.57	11.35	10.00	50	.00	1.28
Avoidance	Male	47.88	10.40	38.10	9.59	7.70	66	.00	1.00
	Female	45.08	10.37	44.71	10.24	.26	51	.80	.04

Motives for Substance Use Scores Compared with Normative Data

Coping, social and enhancement motives for drug use scores obtained from the current substance using sample were compared with the available normative data for this scale. Normative data for this measure was obtained from a random sample of 2,052 adolescents within the city of Buffalo, USA, aged between the ages of 13 and 19 years of age, who were asked about motives for alcohol use. Hypothesis 1c predicted that scores on all these motive scores would be elevated in this clinical substance using sample, compared with the normative data. Cooper (1994) reported that drinking motives are largely invariant across gender, age and race groups, and therefore, normative scores were reported as a whole population. The results of these comparisons are shown in Table 5. Consistent with hypothesis 1c, scores on all the motives for substance use were significantly elevated, with large effect sizes for each of the three subscales.

Table 5

Comparison of Mean Scores on the DUMM

Sample	Current Sample		Normative Sample					
Motives	*Mean*	*SD*	*Mean*	*SD*	*t-test*	*df*	*p*	*Cohen's d*
Social	3.27	1.20	2.46	.98	7.33	118	.00	.81
Coping	3.93	.95	1.60	.75	26.47	116	.00	3.03
Enhancement	3.91	.94	2.15	1.01	20.30	117	.00	1.75

Affect Scores Compared with Normative Data

Measures of positive and negative affect, including anxiety and depression scores from the current substance using sample were compared with available normative data for these measures. The normative data for the PANAS was obtained from a number of undergraduates enrolled in psychology courses at a variety of American universities (Watson et al., 1988). No gender differences were detected in the development of the PANAS, and as such, the normative data was reported as a whole population. The normative data for the MASQ-SF was obtained from college student samples and due to gender differences that were observed, scores are presented by gender (Watson, Clark et al., 1995). Hypothesis 1d predicted that scores on all the negative affect measures would be elevated in the substance using sample, while scores on the positive affect scale would be lower in this sample, as compared with normative data. The results of these comparisons are shown in Table 6.

Consistent with hypothesis 1d, positive affect was lower in the current sample of substance users as compared with the normative population, with a medium effect size. Negative affect for the entire sample, as measured by the PANAS, showed that the current substance using sample displayed significantly higher scores on negative affect, when compared with the normative sample, with a very large effect size being found. Significant differences, also, were found in the anxiety and depression scales of the MASQ-SF. Consistent with hypothesis 1d, depression scores in the current sample were higher for both males and females when compared with the normative sample, with medium and large effect sizes, respectively. Females obtained significantly higher anxiety scores in the current substance using sample, when compared with the normative sample, with a medium effect size. No significant difference in anxiety scores was found when comparing males from the current substance using sample with the normative sample.

Table 6

Comparison of Mean Scores on the PANAS and MASQ Affect Measures

Sample		Current Sample		Normative Sample					
Affect		*Mean*	*SD*	*Mean*	*SD*	*t-test*	*df*	*p*	*Cohen's d*
Positive Affect (PANAS)		28.51	8.97	33.3	7.2	-5.82	118	.00	-.65
Negative Affect (PANAS)		28.64	9.64	17.4	6.2	12.61	116	.00	1.69
Anxiety	Male	23.73	7.41	22.3	6.4	1.56	66	.12	.22
	Female	26.27	7.70	22.6	6.3	3.41	51	.00	.57
Depression	Male	31.18	10.71	24.5	8.7	5.07	66	.00	.74
	Female	36.00	10.77	25.8	8.8	6.76	51	.00	1.14

Section 2: Relationships between Risk Factors as Predictors for Substance Use Behaviours.

A series of hierarchical multiple regression analyses were used to explore the relationship between the measured risk factors, and the severity of dependence and frequency of substance use, whilst controlling for gender effects. Associations between the identified risk factors and the relationships that these factors have with the substance use outcomes measures were first examined using correlational analyses (see Table 7). A number of significant correlations were observed among the measured variables. For example, the personality traits of BAS and BIS were found to be positively correlated (r=.44, p<.01). The negative affect measures (that is, NA, anx, and dep) were all significantly positively correlated, and were not significantly correlated with PA. The negative affect scores were highly correlated, with the emotion-oriented coping scale (e.g. NA: r=.68, p<.01). Such a high correlation violated the assumption of multicollinearity and, as such, these variables should not be entered into a multiple regression analysis together (Tabachnick & Fidell, 2001). Significant intercorrelations were noted, also, among the motives for substance use scales. Scores on the Enhancement Motives and Coping Motives scales were significantly positively correlated (r=.64, p<.01), with both of these scales having significant negative correlations with Social Motives (r=-.64 and -.60, p<.01). As both Enhancement Motives and Coping Motives were transformed using a reflect transformation, a reversal of the direction of correlations occurred. Appendix D shows the correlations with these variables before the transformations were conducted, indicating that all these variables were significantly positively correlated. The

interpretation of these variables throughout this thesis will be based on the direction of correlation that was obtained for non-transformed, rather than transformed variables (Tabachnick & Fidell, 2001).

Table 7

Correlational Matrix for Personality, Coping, Motives and Affect Variables

Variable[1]	BAS	BIS	Cop_Task	Cop_Emo	Cop_Avo	RSQ_Enh	RSQ_Cop	Mot_Soc	PA	NA	Anx	Dep
BAS	1.00	.44**	.11	.43**	.08	-.21*	-.23*	.29**	.12	.28**	.25**	.20*
BIS		1.00	-.14	.44**	-.04	-.01	.18*	.20*	-.06	.37**	.30**	.32**
Cop_Task			1.00	.06	.59**	-.03	.02	.05	.45**	-.00	.04	-.12
Cop_Emo				1.00	.24**	-.33**	-.54**	.37**	.07	.68**	.62**	.66**
Cop_Avo					1.00	-.18	-.11	.21*	.46**	.08	.21*	-.04
RSQ_Enh						1.00	.64**	-.64**	-.18	-.20*	-.25**	-.26**
RSQ_Cop							1.00	-.60**	-.12	-.35**	-.41**	-.40**
Mot_Soc								1.00	.18*	.20*	.39**	.25**
PA									1.00	.07	.10	-.12
NA										1.00	.76**	.74**
Anx											1.00	.76**
Dep												1.00

Notes. [1] BAS=Sensitivity to Reward, BIS=Sensitivity to Punishment, Cop_Task=task-oriented coping (CISS), Cop_Emo=emotion-oriented coping (CISS), Cop_Avo=avoidance coping (CISS), RSQ_Enh=Enhancement Motives (DUMM), transformed using Reflect and Square Root, RSQ_Cop=Coping motives (DUMM), transformed using Reflect and Square Root, Mot_Soc=Social Motives (DUMM), PA=positive affect (PANAS), NA=negative affect (PANAS), Anx=General Distress: Anxiety (MASQ), Dep=General Distress: Depression (MASQ).

* $p<.05$. ** $p<.01$

The results of correlational analyses between substance use, and personality, coping strategies, motives for use, affect variables and gender are displayed in Table 8.

Table 8

Correlational Matrix for Substance Use and Personality, Coping, Motives and Affect Variables

Variable[1]	Age_FDU	Cur_Dia	Life_Dia	SQ_SDS	LG_DSDU	LG_DSCU
BAS	-.14	.13	.13	-.09	.34**	.02
BIS	-.07	-.07	.09	-.17	.02	-.19
Cop_Task	.04	.02	-.02	-.04	-.03	.12
Cop_Emo	-.22*	.03	.28**	-.22*	.21	.24*
Cop_Avo	.12	.07	-.03	-.10	-.02	.35**
RSQ_Enh	.07	-.13	-.35**	.16	-.15	-.26*
RSQ_Cop	.08	-.09	-.25**	.22*	-.35**	-.31**
Mot_Soc	-.13	.14	.28**	-.15	.42**	.34**
PA	-.01	.17	.01	-.04	.12	.28**
NA	-.08	.10	.23*	-.22*	.11	.26*
Anx	-.07	.15	.22*	-.19*	.23*	.44**
Dep	-.13	.01	.15	-.14	.01	.20
Gender	.06	-.11	-.02	-.10	-.05	-.24*

Notes. [1] Age_FDU=Age of first drug use (incl. cigarettes and alcohol), Cur_Dia=number of current substance use diagnoses as defined by SCID-IV, Life_Dia=number of lifetime substance use diagnoses as defined by SCID-IV, SQ_SDS=Substance Dependence Scale, transformed using Square Root, LG_DSDU=Standard Drinking Units per day in the past month, transformed using Logarithm function, LG_DSCU=Standard Cannabis Units per day in the past month, transformed using Logarithm function, BAS=Sensitivity to Reward, BIS=Sensitivity to Punishment, Cop_Task=task-oriented coping (CISS), Cop_Emo=emotion-oriented coping (CISS), Cop_Avo=avoidance coping (CISS), RSQ_Enh=Enhancement Motives (DUMM), transformed using Reflect and Square Root, RSQ_Cop=Coping motives (DUMM), transformed using Reflect and Square Root, Mot_Soc=Social Motives (DUMM), PA=positive affect (PANAS), NA=negative affect (PANAS), Anx=General Distress: Anxiety (MASQ), Dep=General Distress: Depression (MASQ).

* $p<.05$. ** $p<.01$

The number of current substance use diagnoses did not correlate significantly with any of the independent variables. Age of first drug use correlated significantly with emotion-oriented coping only. Thus, no further regression analyses were

conducted with either of these variables. Depression was the only measure of negative affect that did not correlate significantly with any of the substance use outcomes variables. Gender was found to be significantly correlated with daily cannabis use only (r=-.24, p<.05).

Hypothesis 2 was tested using two sets of hierarchical multiple regression analyses. The first set tested the predictive relationships between the personality, coping strategies, motives for use and affect variables and the substance use dependence outcome variables, namely the total SDS scores and the number of lifetime diagnoses. The second set of hierarchical multiple regressions tested the predictive relationships between the personality, coping strategies, motives for use and affect variables and the measures of quantities and frequencies for alcohol and cannabis use, obtained using the TLFB method. Following these analyses, exploratory analyses were conducted to further investigate relationships between the measured risk factors and substance use behaviours.

Relationships with Severity of Dependence

Hierarchical multiple regressions were conducted to test hypothesis 2a, that with gender controlled for, higher scores on measures of BAS, emotion-oriented coping, enhancement motives, and positive affect would be predictive of SDS scores, and the number of lifetime diagnoses of SUD. The results from these hierarchical multiple regressions are displayed in Table 9.

Contrary to prediction, none of the independent variables were significant predictors of scores on the SDS scale. Emotion-oriented coping and enhancement motives emerged as significant predictors of the number of lifetime SUD diagnoses, accounting for 17% of the variance.

Table 9

Hierarchical Multiple Regressions Showing Predictors of Severity of Dependence and Lifetime SUD Diagnoses

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
SQ_SDS					.	
Step 1:	Gender	-.14	.13	-.10	.01	.01
Step 2:	Gender	-.08	.14	-.06		
	BAS	.00	.02	.02		
	Cop_Emo	-.01	.01	-.18		
	RSQ_Enh	.08	.07	.11		
	PA	-.00	.01	-.02	.06	.05
Life_Dia						
Step 1:	Gender	-.07	.25	-.02	.00	.00
Step 2:	Gender	-.27	.26	-.10		
	BAS	.00	.04	.00		
	Cop_Emo	.02	.01	.22*		
	RSQ_Enh	-.41	.13	-.29**		
	PA	-.01	.01	-.08	.17**	.17**

Notes. [1] SQ_SDS=Substance Dependence Scale, transformed using Square Root, Life_Dia=number of lifetime substance use diagnoses as defined by SCID-IV, BAS=Sensitivity to Reward, Cop_Emo =emotion-oriented coping (CISS), RSQ_Enh=Enhancement Motives (DUMM), transformed using Reflect and Square Root, PA=positive affect (PANAS).

* $p<.05$. ** $p<.01$

Hierarchical multiple regression analyses were conducted to test the prediction made in hypothesis 2b, that, with gender controlled for, higher scores on measures of BIS, avoidance coping, coping motives for use, and negative affect were predictive of the SDS and the number of lifetime SUD diagnoses. The results of these regressions are presented in Table 10.

The predictions made in Hypothesis 2b were not confirmed, as none of the variables entered into the regression were significant predictors of the SDS. Coping motives for use emerged as a significant predictor of number of lifetime diagnoses, accounting for 10% of the variance.

Table 10

Hierarchical Multiple Regressions Showing Predictors of Severity of Dependence and Lifetime SUD Diagnoses

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
SQ_SDS					.	
Step 1:	Gender	-.14	.13	-.10	.01	.01
Step 2:	Gender	-.05	.14	-.03		
	BIS	-.02	.02	-.09		
	Cop_Avo	-.01	.01	-.09		
	RSQ_Cop	.10	.07	.15		
	NA	-.01	.01	-.12	.09	.08
Life_Dia						
Step 1:	Gender	-.07	.26	-.02	.00	.00
Step 2:	Gender	-.33	.26	-.12		
	BIS	.00	.03	.00		
	Cop_Avo	-.01	.01	-.09		
	RSQ_Cop	-.29	.14	-.21*		
	NA	.03	.02	.20	.10*	.10*

Notes. [1] SQ_SDS=Substance Dependence Scale, transformed using Square Root, Life_Dia=number of lifetime substance use diagnoses as defined by SCID-IV, BIS=Sensitivity to Punishment, Cop_Avo=avoidance coping (CISS), RSQ_Cop=Coping motives (DUMM), transformed using Reflect and Square Root, NA=negative affect (PANAS).

* $p<.05$. ** $p<.01$

Relationships with Frequency of Drug Use

As highlighted previously, Hypothesis 2 was tested using two sets of hierarchical multiple regression analyses. The first set tested predictions regarding the measures of substance use dependence outcome variables, namely the total SDS scores and the number of lifetime diagnoses, and were reported above. The second set of hierarchical multiple regressions tested predictions regarding the measures of quantities and frequencies of alcohol and cannabis use obtained using the TLFB method.

To participate in this study, individuals were required to be attending a treatment service for substance misuse. As part of the study, information was collected about the quantities and frequency of alcohol and cannabis use, as measured using the TLFB method. Due to the fact that not all the participants had used these particular substances in the past month, the number of participants for these analyses was reduced. Tabachnick and Fidell (2001) stated that the minimum requirement for multiple regression is to have at least five times more cases than independent

variables. Using this equation the sample size is more than adequate to undertake a hierarchical multiple regression using five independent variables, for both alcohol (N=79) and cannabis (N=92).

In line with the hierarchical multiple regressions conducted to test Hypothesis 2a, it was predicted that, with gender controlled for, higher scores on measures of BAS, emotion-oriented coping, enhancement motives for use, and positive affect would be significantly associated with more frequent and higher levels of substance use. The results of these analyses are shown in Table 11.

Table 11

Hierarchical Multiple Regressions Showing Predictors of Alcohol and Cannabis Use

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
LG_DSDU					.	
Step 1:	Gender	-.04	.08	-.05	.00	.00
Step 2:	Gender	-.08	.08	-.12		
	BAS	.03	.01	.30*		
	Cop_Emo	.00	.00	.10		
	RSQ_Enh	-.01	.04	-.04		
	PA	.00	.00	.04	.14	.14*
LG_DSCU						
Step 1:	Gender	-.24	.10	-.24*	.06	.06*
Step 2:	Gender	-.27	.11	-.27*		
	BAS	-.02	.01	-.13		
	Cop_Emo	.01	.01	.31**		
	RSQ_Enh	-.08	.05	-.14		
	PA	.01	.01	.19	.23	.17**

Notes. [1] LG_DSDU=Standard Drinking Units per day in the past month, transformed using a logarithm function, LG_DSCU=Standard Cannabis Units per day in the past month, transformed using a logarithm function, BAS=Sensitivity to Reward, Cop_Emo=emotion-oriented coping (CISS), RSQ_Enh=Enhancement Motives (DUMM), transformed using Reflect and Square Root, PA=positive affect (PANAS).

* $p<.05$. ** $p<.01$

The predictions made in Hypothesis 2a were partially confirmed, as shown in Table 11. 'Trait impulsivity' (BAS) emerged as the only significant predictor of SDU, accounting for 14% of the variance. When the number of SCU was entered as the dependent variable, it was found that gender and emotion-oriented coping were significant predictors in this model. Emotion-oriented coping explained 17% of the variance, over and above the effect of gender.

In line with the hierarchical multiple regressions conducted on dependence severity measures, similar regression analyses were conducted using quantity of SDU and SCU as dependent variables. As predicted by Hypothesis 2b, with gender controlled for, higher scores on measures of BIS, avoidance coping, coping motives for use, and negative affect would be predictive of more frequent and larger quantity of alcohol and cannabis use. The results of these analyses are shown in Table 12.

Table 12

Hierarchical Multiple Regressions Showing Predictors of Alcohol and Cannabis Use

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
LG_DSDU					.	
Step 1:	Gender	-.04	.08	-.05	.00	.00
Step 2:	Gender	-.09	.08	-.14		
	BIS	-.00	.01	-.03		
	Cop_Avo	-.00	.00	-.09		
	RSQ_Cop	-.13	.04	-.38**		
	NA	.00	.00	.03	.15	.14*
LG_DSCU						
Step 1:	Gender	-.24	.10	-.24*	.06	.06*
Step 2:	Gender	-.27	.09	-.27**		
	BIS	-.04	.01	-.29**		
	Cop_Avo	.01	.00	.25**		
	RSQ_Cop	-.15	.05	-.28**		
	NA	.02	.01	.31**	.38	.32**

Notes. [1] LG_DSDU=Standard Drinking Units per day in the past month, transformed using a logarithm function, LG_DSCU=Standard Cannabis Units per day in the past month, transformed using a logarithm function, BIS=Sensitivity to Punishment, Cop_Avo=avoidance coping (CISS), RSQ_Cop=Coping motives (DUMM), transformed using Reflect and Square Root, NA=negative affect (PANAS).

* $p<.05$** $p<.01$

Contrary to the hypothesis, the combination of variables stated above were not predictive of standard alcohol units per day, with only the coping motives variable emerging as a significant predictor in this regression, accounting for 14% of the variance. However, with SCU entered as the dependent variable in the hierarchical multiple regression analysis, the results supported the hypothesis that, with gender controlled for, BIS, avoidance coping, coping motives for use and negative affect were predictive of daily cannabis use, with the combination of variables, explaining 32% of the variance. However, it is important to note that BIS was negatively related to cannabis use, while all the other variables were positively related. In addition,

although the coping motives variable shows a negative relationship, this association was interpreted in the reverse direction due to the reflected transformation (Tabachnick & Fidell, 2001).

Exploratory Analyses

Given the paucity of data in this area of research, exploratory analyses were conducted, based on correlational findings, to investigate which combination of risk factors were best predictive of substance use behaviours in this sample. Analyses were guided by the significant correlations found (see Table 8). Hierarchical multiple regressions were conducted to investigate if any of the variables, significantly predicted both the SDS scores and the number of lifetime diagnoses. To control for gender effects, gender was entered into the hierarchical multiple regression at Step 1. Emotion-oriented coping, and coping motives for use were significantly correlated with SDS, while emotion-oriented coping and enhancement motives for use were significantly correlated with the number of lifetime diagnoses. The results of these exploratory regressions are shown in Table 13.

Table 13

Hierarchical Multiple Regressions Exploring Significant Predictors of SDS and Lifetime SUD Diagnoses

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
SQ_SDS					.	
Step 1:	Gender	-.14	.13	-.10	.01	.01
Step 2:	Gender	-.04	.13	-.03		
	Cop_Emo	-.01	.01	-.14		
	RSQ_Cop	.10	.08	.14	.06	.05*
Life_Dia						
Step 1:	Gender	-.07	.25	-.02	.00	.00
Step 2:	Gender	-.22	.25	-.08		
	Cop_Emo	.02	.01	.21*		
	RSQ_Enh	-.39	.13	-.28**	.16	.16**

Notes. [1] SQ_SDS=Substance Dependence Scale, transformed using Square Root, Life_Dia=number of lifetime substance use diagnoses as defined by SCID-IV, Cop_Emo =emotion-oriented coping (CISS), RSQ_Cop=Coping motives (DUMM), transformed using Reflect and Square Root, RSQ_Enh=Enhancement Motives (DUMM), transformed using Reflect and Square Root.

* $p<.05$. ** $p<.01$

The results from the hierarchical multiple regression analyses indicated that neither emotion-oriented coping nor coping motives for use were significantly

predictive of substance dependence, as measured by the SDS. Enhancement motives and emotion-oriented coping were found to be significantly predictive of the number of lifetime SUD diagnoses, accounting for 16% of the variance.

Further hierarchical multiple regressions were conducted to investigate relationships between risk factors and SDU per day and SCU per day, with the variables entered into the model being guided by the significant correlations, reported in Table 8. BAS, emotion-oriented coping and social motives for use were significantly positively correlated with SDU. Emotion-oriented coping, social motives for use and positive affect correlated significantly with SCU, and were entered into the exploratory hierarchical regression. In addition, the anxiety variable was found to be highly correlated with daily use of SCU, with a significant correlation (r=.44, p<.01). The General Distress: Anxiety variable (GDA), as measured by the MASQ-SF, was considered a measure of negative affect, and was found to be highly correlated with the negative affect score on the PANAS (r=.76, p<.01). Therefore, GDA was entered in Step 2 of a hierarchical multiple regression, in conjunction with BIS, avoidance coping, and coping motives for use variables. The results from these further analyses are presented in Table 14.

Table 14

Hierarchical Multiple Regressions Exploring Significant Predictors of Alcohol and Cannabis Use

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
LG_DSDU					.	
Step 1:	Gender	-.04	.08	-.05	.00	.00
Step 2:	Gender	-.06	.07	-.08		
	BAS	.02	.01	.25*		
	Cop_Emo	.00	.00	.00		
	Mot_Soc	.02	.01	.35**	.24	.24**
LG_DSCU						
Step 1:	Gender	-.24	.10	-.24*	.06	.06*
Step 2:	Gender	-.27	.10	-.27*		
	Cop_Emo	.01	.00	.22*		
	Mot_Soc	.02	.01	.22*		
	PA	.01	.01	.17	.24	.18**
LG_DSCU						
Step 1:	Gender	-.24	.10	-.24*	.06	.06*
Step 2:	Gender	-.27	.09	-.26**		
	BIS	-.04	.01	-.30**		
	Cop_Avo	.01	.00	.19*		
	RSQ_Cop	-.11	.05	-.21*		
	Anx	.03	.01	.44**	.45	.39**

Notes. [1] LG_DSDU=Standard Drinking Units per day in the past month, transformed using a logarithm function, LG_DSCU=Standard Cannabis Units per day in the past month, transformed using a logarithm function, BAS=Sensitivity to Reward, Cop_Emo=emotion-oriented coping (CISS), transformed using Reflect and Square Root, Mot_Soc=Social Motives (DUMM), PA=positive affect (PANAS), RSQ_Cop=Coping motives (DUMM), Anx=General Distress: Anxiety (MASQ).

* $p<.05$. ** $p<.01$

The hierarchical multiple regression that was conducted using the number of SDU per day entered as the dependent variable, indicated that BAS and social motives for use predicted 24% of the variance, and that, although emotion-oriented coping was significantly correlated with this alcohol use variable, it was not a significant predictor in this regression model. When SCU was entered as the dependent variable, gender, emotion-oriented coping, and social motives proved significant predictors of substance use. Emotion-oriented coping and social motives predicted 18% of the variance of daily cannabis use, over and above the effect of gender. The hierarchical multiple regression conducted using the anxiety variable, in conjunction with the BIS, avoidance coping, and coping motive for use variables, resulted in a significant model. BIS, avoidance coping, coping motives for use and anxiety accounting for a

large amount of the variance at 39%, over and above the effect of gender, with BIS showing a negative relationship, and all the other variables displaying a positive relationship. Please note that the coping motives variable was interpreted in the reverse direction due to the reflected transformation (Tabachnick & Fidell, 2001). Results indicated a complex pattern of relationships present, with BIS being significantly negatively associated with cannabis use, anxiety being significantly positively related to cannabis use, and BIS and anxiety being positively significantly correlated to each other (as seen in Table 7).

Discussion

This study aimed to explore the relationship between substance use in young people and four established risk factors for substance use, including personality, coping strategies, motives for use, and affect, using multimodal assessments and a biological theory of personality (RST, Gray, 1970, 1981). Following is a discussion based on the findings obtained in Study One.

Firstly, young substance users' performances on measures of the selected risk factors were compared to general population norms. A number of significantly different scores were found between the normative data of each variable, and the current clinical substance using sample. These differences are discussed separately below.

Personality

As predicted in Hypothesis 1a, scores on a measure of BAS were significantly higher in females, showing support for the notion that elevated BAS scores are present in substance using populations. This is consistent with previous studies that have found heightened BAS levels in drug users in clinical populations (Franken, 2002; Franken et al., 2006), community samples (Johnson et al., 2003; Jorm et al., 1999), and in an Australian sample of problem drinkers (Kambouropoulos & Staiger, 2007). Contrary to prediction, no significant difference was found for males on scores of a BAS measure, when compared with the normative data scores. This result suggests that an elevated BAS score in males, reflecting high 'reward sensitivity', may not be an important factor for substance use. This finding is inconsistent with previous research, as highlighted above, where elevated BAS scores have been found

in drug users for both genders (Franken, 2002; Johnson et al., 2003; Jorm et al., 1999).

A possible explanation is that the lack of significant difference in males' scores on the BAS, was due to the observed higher baseline 'reward sensitivity' (BAS) score, for males, as compared with females, reported in the normative scores on the SPSRQ. Elevated BAS scores in males have not been reported in other studies (e.g. Jorm et al., 1999). It is possible that males from the SPSRQ normative sample, coincidently, had elevated BAS levels, when compared to the female sample, and males in the general population. However, the finding that BAS levels were not elevated in this substance using sample, does not rule out the possibility of BAS being an important risk factor in the development of a SUD. Thus, for example, 'reward sensitivity' might influence the development of SUD in conjunction with other risk factors. If these other risk factors for SUD are not present, then males may involve themselves in some other activity to satisfy this 'reward sensitivity' trait, such as extreme sports. Possible interactions between risk factors are discussed further when examining findings in relation to Hypothesis 2.

As predicted by Hypothesis 1a, BIS scores were found to be higher for both males and females in this substance using sample. This is consistent with previous research, which has found that BIS, and related constructs, such as neuroticism, are elevated in substance use populations (O'Connor et al., 1995; Sher et al., 1991) and related to substance use in community samples (Taylor et al., 2006), indicating support for the notion that this construct is an important risk factor for SUD. However, it is inconsistent with BIS scores measured in Australian samples, where no difference was found between problem drinkers and matched controls (Kambouropoulos & Staiger, 2004, 2007), and where BIS is found to have a negative association with substance use (Franken & Muris, 2006a). As with BAS, gender differences were observed, with the difference in male scores having a small effect size, compared with the moderate effect size found for females. This is in line with previous research which has concluded that neuroticism is an important substance use risk factor, in particular for females (Byrne et al., 1994; Khan et al., 2005), with longitudinal evidence suggesting that women who are higher in these traits may be predisposed to substance use problems (Jones, 1971). However, the role that gender plays with respect to BIS and substance use may be complicated, as this finding is

also inconsistent with research that has reported elevated BIS scores in females acting as a protective factor, while being an increased risk of substance use in males (Knyazev, 2004; Knyazev, Slobodskaya, Kharchenko et al., 2004).

Coping Strategies

As predicted by Hypothesis 1b, task-oriented coping strategies were used significantly less in the current substance using sample, as compared with the normative population. This indicated that substance users utilise fewer active strategies to cope with or remove the stressors in their life. Also consistent with the hypothesis was the finding that, compared with the normative sample, both males and females in the current sample use significantly increased emotion-oriented coping. A conclusion based on these findings is that using substances is a way of regulating distressing emotions. Therefore, if individuals are more likely to utilise drug taking as a means of escape or as a way to regulate emotions to cope with stressors, they might be more likely to develop substance use problems, particularly if they have a number of stressors in their lives (Barnea et al., 1993; Cooper et al., 1992; Neighbors et al., 1992).

Also, as predicted by Hypothesis 1b, avoidance coping scores for males were significantly elevated in this clinical substance using sample, when compared with normative scores. This finding was consistent with previous research, which has reported that adolescents who showed an increase in avoidance coping strategies were more at risk of developing substance use problems (Labouvie, 1986, 1987; Wagner et al., 1999; Wills, 1986; Wills et al., 1996), and that the continued use of avoidance strategies maintained substance use behaviours (Cronkite & Moos, 1984, as cited in Eftekhari et al., 2004; Wills & Hirky, 1996). For males, the above findings were consistent with research, indicating that individuals engaging in more task-oriented coping and less avoidance coping were less likely to develop substance use problems, and had greater success in recovery attempts (Cooper et al., 1988; Finney & Moos, 1995).

For females, there was no significant difference in scores on the avoidance coping scale. The present finding indicated that the use of avoidance coping strategies may not be an important risk factor for the development of substance use behaviours in females. As highlighted above, this was inconsistent with previous research that has

stressed that the use avoidance coping has shown to be significant for the development of substance use problems, and also the maintenance of substance use behaviours (Cooper et al., 1988; Finney & Moos, 1995), even after controlling for gender (Wagner et al., 1999). Although the female scores, in the current substance using sample, were not significantly higher that the normative data, they displayed similar levels of avoidance coping as the males, in the substance using sample. Therefore, it is possible that when higher levels of avoidance coping are utilised, interactions with other substance use risk factors, such as personality, may occur, and result in the development of substance use problems.

Motives for Substance Use

Consistent with Hypothesis 1c, the motives for substance use were elevated in this substance using sample, as compared with the normative data. This result was not surprising, as individuals who engage in regular substance use would be more likely to report an increased number of motives to use these substances. However, it is interesting to note that the two samples differ in the ranking of motives, with respect to the most frequently cited reasons for use. In the normative population, the most common motive for substance use was social motives, while in the clinical population, social motives were the least frequently cited reason, with enhancement and coping motives being reported more often. The finding of elevated levels of enhancement and coping motives in this substance using sample was consistent with previous research, which has shown that enhancement motives were significantly correlated with heavy drinking, and that coping motives were significantly correlated with problem alcohol use (Kuntsche et al., 2005). In summary, the present findings, that internal motives (that is, enhancement and coping) were reported more frequently than social motives in this sample comprised of young people with problematic patterns of substance use, was consistent with previously cited findings in the alcohol use field (Kuntsche et al., 2005).

Affect

As predicted in Hypothesis 1d, the clinical substance using sample obtained significantly lower scores in positive affect, and higher scores in negative affect, as measured by the PANAS. The individuals that were included in this current sample were in treatment programs for substance use, perhaps reducing the likelihood of

these individuals experiencing high levels of positive affect, and increasing the chance of experiencing negative affect. This is consistent with previous research, which has typically found a positive association between negative affect substance use (Cooper et al., 1988; Cooper et al., 1992; Hussong & Chassin, 1994; Hussong, Hicks, Levy, & Curran, 2001). A major problem with using this general negative affect measure, is its lack of specificity. Although a lot of support has been found for the significant relationship between affect and substance use, some findings suggest that this relationship may be more complex. Hussong (1994) recommended using more specific measures that tap into specific components of negative affect, such as anger, depression and anxiety.

The depression scores for both males and females, also, were significantly elevated in the current substance using sample. This finding was consistent with previous research, which has found positive relationships specifically between depression and substance use (Kumpulainen & Roine, 2002), with childhood depressive symptoms predicting later alcohol initiation (Kaplow, Curran, Angold, & Costello, 2001). The findings on the anxiety scale differed with respect to gender, with, as predicted, females in the current sample displaying significantly higher levels of anxiety. However, no difference, when compared with males in the normative sample, was found in the scores for the male participants. This result indicated that males in this substance using sample were not highly anxious, with this finding suggesting that perhaps anxiety had little or no influence on their decision regarding substance use. An alternative conclusion, consistent with the affect regulation hypothesis for substance use (Cooper et al., 1995), was that individuals who were currently using substances were able to control their anxious feelings by using particular substances, resulting in an absence or reduction of anxiety. A further possibility was that males were less likely to report certain feelings included in the anxiety scale, such as 'feeling afraid' or 'feeling nervous', as they might consider these feelings a 'sign of weakness'.

Relationships between Risk Factors and Substance Use

Correlational and hierarchical multiple regression analyses were used to examine the predictive relationship of personality, coping, motives for substance use and affect on severity of substance dependence and frequency of substance use in a sample of young substance users. Some significant correlations were found in the

analyses, which are worth noting. Firstly, there was a significant positive correlation between BAS and BIS scores on the personality measures. It is difficult to account for such a high correlation given that Gray's (1970; 1981) original theory posited that these traits were orthogonal, however, recent revisions of this model have indicated that the BAS and BIS may, in some situations, work as joint subsystems (Corr, 2002, 2004). This point is discussed further in the theoretical considerations in the final chapter of this thesis. Secondly, emotion-oriented coping and negative affect displayed a significant positive association. One possible interpretation of this finding is that individuals, who report high levels of negative affect, make use of significantly more emotion-oriented coping, as a means of regulating these distressing emotions. This interpretation is consistent with the definition of emotion-oriented coping, as a means of regulating emotions (Endler & Parker, 1999), however, the directionality of the relationship is unclear, due to the cross-sectional nature of this research. Therefore, conclusions cannot be reached about whether individuals who display increased negative affect use more emotion-oriented coping, or individuals who use more emotion-oriented coping experience more negative affect.

Hypothesis Two predicted relationships between personality, specifically the BAS (trait impulsivity) and BIS (trait anxiety) dimensions in Gray's (1970; 1981) model of personality (RST); emotion-oriented, avoidance and task-oriented coping strategies; coping, enhancement and social motives for substance use, and positive and negative affect in a sample of young substance users. Due to the gender specific effects, previously reported, in personality and substance use research (Byrne et al., 1994; Khan et al., 2005), gender was controlled for in these analyses. This summary does not include comments on any gender effects that may have been present, focussing on interactions that were present after these effects were controlled for. Hypothesis Two explored the relationships between the different measured risk factor variables, and the different parts of this hypothesis will be commented on separately.

Hypothesis 2a predicted that higher scores on BAS, emotion-oriented coping, enhancement motives and positive affect would be predictive of more severe substance dependence and more frequent substance use. It was found that emotion-oriented coping and enhancement motives for use were predictive of the number of lifetime diagnoses, and this predictive relationship was further confirmed in the exploratory analyses. Although the enhancement motives variable, displayed a

negative relationship with the independent variables, this was interpreted in the reverse direction due to the reflected transformation (Tabachnick & Fidell, 2001). Emotion-oriented coping is a strategy that aims to regulate feelings, and is usually described as a way to manage distressing feelings. However, the results from the current study suggest that, when coupled with enhancement motives (motives aimed at enhancing positive feelings), emotion-oriented coping was used to improve positive emotions, rather than manage distressing emotions. In summary, emotion-oriented coping and enhancement motives were found to be predictive of substance use severity in this population.

Results from analyses undertaken to test Hypothesis 2a, indicated that, BAS was the only hypothesised independent variable that was predictive of alcohol use. This finding suggested that this personality trait plays an important role in alcohol use, and is consistent with previous findings (Johnson et al., 2003; Jorm et al., 1999). Emotion-oriented coping emerged as an independent predictor of cannabis use, indicating that individuals use cannabis as a means of coping with their emotional distress. In an exploratory analysis, BAS and social motives were found to be significantly predictive of alcohol use. This result suggested that individuals high in 'reward sensitivity' used alcohol as a way of interacting with other people to obtain a rewarding experience. The finding that social motives was a significant independent predictor of alcohol use is consistent with previous motives research, showing that social motives were the most common reasons for alcohol use in young people (Kuntsche et al., 2005). Cultural factors may account for the finding that social motives was more predictive of alcohol use, compared with other substances. In the Australian culture, for example, alcohol is associated with many recreational pastimes. In addition to being predictive of alcohol use, social motives, together with emotion-oriented coping, were predictive of cannabis use. Cannabis use is illegal and not as widely accepted in Australian culture and society, as alcohol use. However, in the cultural context of the current sample, comprised of heavy substance users with a significant history of SUD (evidenced by 72.3% (n=86) of the sample having had three or more lifetime SUD diagnoses), cannabis use might be more accepted. Thus, if many of the sample's peers were also taking drugs, cannabis use might be viewed as a social experience, similar to alcohol use for the general population.

Hypothesis 2b stated that higher scores on BIS, avoidance coping, coping motives and negative affect would be predictive of more severe substance dependence and more frequent substance use. All the hypothesised variables were predictive of cannabis use, with avoidance coping, coping motives and negative affect showing support for these specific hypothesised interactions of risk factors. BIS was also predictive of cannabis use, although this displayed a negative relationship, indicating that lower scores on BIS were predictive of more frequent substance use. The negative relationship found between BIS and substance use is consistent with previous research exploring drinking behaviours (Franken & Muris, 2006a), as well as studies showing that a higher score on BIS may be a protective factor in females (Knyazev, 2004; Knyazev, Slobodskaya, Kharchenko et al., 2004). However, the present finding is inconsistent with research showing no relationship between BIS and substance use (Franken et al., 2006), and research indicating a positive relationship between neuroticism and related constructs (such as BIS) within a substance using population (Brady et al., 1993; Taylor et al., 2006).

In addition, the results from the exploratory analysis showed that the predictive variance increased for this combination of risk factors when anxiety was used as the measure of negative affect, with avoidance coping, coping motives and anxiety having positive relationships, while BIS continued to show a negative relationship. The effect of adding a specific anxiety measure could be interpreted as supporting the notion of cannabis use for affect regulation purposes, specifically as a way of controlling anxious feelings. In summary, it appeared that a decreased sensitivity to punishment, as well as an increased general anxiety was predictive of cannabis use. This was an interesting finding, particularly as BIS is considered to be the underlying biological basis of anxiety (Gray, 1970), a view that was supported by the significant positive relationship found between these two variables (see Table 7). Further investigation into the complex relationships between these risk factors is warranted.

The finding that coping motives was predictive of alcohol use over the past month, and also, the number of lifetime diagnoses, was consistent with previous research on motives for alcohol use, which indicated an association between coping motives for drinking and alcohol problems (Kuntsche et al., 2005). In addition, the finding that coping motives for use was a significant predictor of the number of

lifetime diagnoses, showed support for the importance of coping motives in problem use across all drug types, not just alcohol. None of these independent variables were found to be predictive of SDS.

In summary, established risk factors were examined by comparing scores on measures of personality, coping strategies, motives for use and affect in this substance using sample with those from normative samples. Relationships were then examined between substance use outcome variables and the independent risk factors, with the emergence of mixed and inconsistent results. Some significant interactions were found in this substance using population, which showed support or partial support for the hypothesised relationships. However, in some instances, none of the measured variables were found to be predictive. Differences emerged, also, when different substance severity outcome measures were used as the dependent variable.

Limitations of this research and future directions will be discussed in the final chapter.

CHAPTER THREE
STUDY TWO

Introduction

In Study One there were a number of significant relationships found between the risk factors examined, and the substance use outcome variables, including the personality trait of BAS (trait impulsivity). While, as highlighted in the introduction of this thesis, research indicates that the psychological and biological mechanisms that underlie the impulsivity construct are unclear (Milich et al., 1994; Moeller et al., 2001), a recent review (Dawe et al., 2004) concluded that impulsivity consists of two factors, namely 'rash impulsivity' and 'reward sensitivity'. It is incumbent upon research to attempt to further clarify the structure of impulsivity, in order to obtain a more informed picture of its role in substance use disorders.

This study focused specifically on the measurement and structure of the construct of impulsivity. The aim was to examine the convergent validity between self-report and neuropsychological measures of 'rash impulsivity' and 'reward sensitivity' in a sub-sample of adolescent substance users. The hypotheses for Study Two regarding the relationship between self-report and neuropsychological measures of 'rash impulsivity' and 'reward sensitivity' are detailed below. It was hypothesised that, when controlling for attention and executive functioning factors:

a. The self-report measure of 'rash impulsivity' (as measured by the BIS-11) will be predictive of go/no-go performance under neutral conditions.
b. The self-report measure of 'reward sensitivity' (as measured by the SPSRQ) will be predictive of go/no-go performance under reward conditions.
c. The self-report measure of 'reward sensitivity' (as measured by the SPSRQ) will be predictive of scores on the DDT.
d. The two behavioural measures of 'reward sensitivity', namely the DDT and the go/no-go performance under reward conditions, will be significantly positively correlated.

Method

Sample

The participants were a subset of 60 young substance users who had participated in Study One, and had given permission to be contacted for further involvement. Participants were either, contacted at a later date, following the completion of Study One, and an interview time was arranged, or, if time permitted, the interview occurred directly following the completion of Study One. Participants were aged between 18 and 30 years of age, with a mean age of 22.2 (S.D. = 3.58) years. In this subgroup, there were 34 (56.7%) males, and 26 (43.3%) females. Participants in this study were all clients of the Drug and Alcohol Services West (DASWest) detoxification unit.

Similar demographics were found in this subgroup as for in the Study one sample, with the majority of the participants being Caucasian (81.7%), and the remaining participants coming from Asian (13.3%), African (3.3%) or Middle Eastern (1.7%) backgrounds. A high percentage (81.7%) was unemployed at the time of the interview, with 15.0% in employment and the remaining 3.3% still at school. Many of the participants had progressed to secondary education (91.7%) with very few continuing on to complete a university degree (3.3%) or TAFE (3.3%) course.

Inclusion Criteria

The criteria for inclusion in this study were young people between 18 and 30 years old, attending AOD agencies for the treatment of substance misuse, had participated in Study One, and were able to provide informed consent.

Exclusion Criteria

Individuals were excluded from the study if they were found not to have any lifetime substance use diagnosis, they were intoxicated at the time of the interview, had current psychotic symptoms, or were unable to provide informed consent.

Measures

Self Report Impulsivity Measures

Barratt Impulsiveness Scale (BIS-11, Patton et al., 1995)

The BIS-11 is a 30 item self-report questionnaire assessing impulsivity. Participants were asked to rate how frequently specific statements applied to them.

This measure used a Likert scale ranging from 1 to 4 including ratings of '1' = rarely/never, '2' = occasionally, '3' = often, and '4' = almost always/always. All items were summed, resulting in impulsivity scores ranging from 30 to 120. The higher the summed score, the higher the level of impulsiveness. This measure has been found to have adequate internal consistency, with alpha coefficients ranging from .79 to .83 in both adult (Patton et al., 1995) and adolescent populations (Stanford, Greve, Boudreaux, Mathias, & Brumbelow, 1996). In the current study, a Cronbach's alpha of .79 was found.

Sensitivity to Punishment and Sensitivity to Reward Quesionnaire (SPSRQ, Torrubia et al., 2001)

As described in Chapter Two, the SPSRQ is a self-report measure designed to assess individual differences in the anxiety or sensitivity to punishment (SP) dimension, and the impulsivity or sensitivity to reward (SR) dimension of Gray's (1970; 1981) neuropsychological model of personality (RST). The SR scale is the main focus in this study, as it is the measure of Gray's 'trait impulsivity'. As stated in Chapter Two, the SR scale has demonstrated good reliability, with internal consistency alpha level scores of .78 (Torrubia et al., 2001), and .74 (O'Connor et al., 2004). Adequate test-retest scores have also been demonstrated, ranging from .87 to .89 over a three month period to .69 to .74 after a year (Torrubia et al., 2001). For the smaller sample (n=60) in the current study, the internal consistency for SR was .64.

Neuropsychological Impulsivity Measures

Go/No-Go Task (Swainson et al., 2003)

Go/no-go tasks have been widely recognised as a behavioural measure of impulsivity (Kindlon et al., 1995). The computer-based task that was used in this study was an adaptation of this well-validated task. Working on a laptop computer, individuals were required to make left/right responses as quickly and as accurately as possible (via button press). Individuals saw alternating left- and right-facing arrows and were asked to indicate the direction of the arrows, via the relevant button press response. The green arrows were designated as the GO task, and required an immediate response. The red arrows were designated as the WAIT task, and required the response to be withheld until stimulus offset (that is, button press response was required when the red arrow disappeared from the screen). This latter task of response inhibition examined the ability to inhibit impulsive behavioural responses.

Two conditions of the same task were presented to each participant. The first task, a neutral condition to measure 'rash impulsivity', involved participants completing the task described above. The second condition aimed to measure 'reward sensitivity', and involved the go/no-go task described above, with an additional monetary reward of 25 cents offered to the participants for every correct inhibition response (that is, each time they successfully withheld their response on the WAIT or red arrow stimulus). The order of presentations for these two conditions was varied to control for practice effects (that is, half the sample were presented with the neutral condition first, while the other half were presented with the reward condition first). The scores that were examined in this study were the correct inhibition of red arrows, for both the neutral and the reward condition. A higher score showed that the individual was able to successfully inhibit their responses, and indicated less impulsivity. From these two scores, the difference between correct inhibition scores (reward minus neutral) were calculated, with a higher score indicating an individual who was more sensitive to reward.

Delayed Discounting Task (DDT, Petry & Casarella, 1999)

A version of the DDT was used as a measure of impulsive decision-making (preference for a smaller reward sooner, over a larger reward later) and 'reward sensitivity'. The DDT assesses the degree to which individuals devalue delayed consequences, where the subjective value of a reward decreases with increasing time periods (Lagorio & Madden, 2005). In this task, participants were presented with a series of prospective choices between hypothetical monetary amounts over increasing time periods, which were printed on index cards (e.g., the choice between $200 now and $1000 in 1 week). The same instructions, including cards (presented in descending order only), amounts (up to $1000), and delays, were used, as per the widely used protocol (Alessi & Petry, 2003; Dixon, Marley, & Jacobs, 2003; Petry, 2002) developed by Petry and Casarella (1999). More extreme discounting, wherein the value of a larger later reward is discounted enough that its subjective value is less than that of the smaller sooner alternative, is indicative of an impulsive decision.

Previous studies have shown that a hyperbolic function best explains the relationship between subjective value and delay, with the following equation expressing this model:

$v_d = V/(1+kd)$.

Where v_d is the current subjective value of a delayed reward (or the indifference point); V is the value of the delayed reward; *d* is the delay duration; and *k* is the constant proportional to the degree of delay discounting (as empirically determined). This equation has been shown to model choices made by both humans and non-humans (Petry & Casarella, 1999). To assess the rate of discounting, the above hyperbolic equation was fitted to each participants' indifference point, and a *k* value was obtained using the Solver subroutine in Microsoft excel, as used in Mitchell (1999). The higher the *k* value, the steeper the resultant curve, the more the individual discounted the delayed money, reflecting higher levels of impulsivity. Natural logarithms of *k* were used, in order to achieve normality in the data.

Control Measures - Attention and Executive Functioning

Stroop Colour and Word Task (Golden & Freshwater, 1998)

The Stroop Colour and Word Task is a test of response inhibition and selective attention. The Stroop Test required subjects to inhibit automatic responses by naming the colour of ink in which colour words are presented. Three formats were presented:

4) Reading colour words that are written in black ink (Word);

5) Reading colour words that are printed in ink of different colours (Colour); and

6) Finally, naming the colour of the printed ink (Colour-Word).

This test yields three basic raw scores, derived from the total number of words read for each of the three conditions. A predicted Colour-Word score was calculated from the separate Word and Colour scores, and then compared to the actual Colour-Word score obtained to generate an interference score. When the interference score is positive, the actual Colour-Word score is higher than predicted, indicating that a person is able to inhibit the word naming response. A negative interference score indicates that the word reading actively interferes with the colour naming process, indicating cognitive inflexibility.

Reliabilities in the Stroop Task are highly consistent, with reported alpha internal consistency scores of .88, .79 and .71; .89, .84, and .73; and .86, .82 and .73, for each of the three raw scores obtained (Golden & Freshwater, 1998).

Digit Span Subtest (DS, Wechsler, 1997)

The DS subtest of the Wechsler scales (1991; 1997) is comprised of digits forwards and digits backwards, where subjects are required to repeat progressively longer orally presented number sequences, both in forward and reverse order. To calculate the total score, 1 point was given for each successful trial passed, with a maximum score of 16 for digits forward, and 14 for digits backwards, thereby producing a maximum of 30 points overall. Using the raw score, an age-corrected scaled score was obtained using the WAIS-III manual (Wechsler, 1997). The DS subtest has a reliability alpha co-efficient of 0.71 (Ackerman, Beier, & Boyle, 2005).

Wechsler Test of Adult Reading (WTAR, The Psychological Corporation, 2001)

The WTAR is a reading test, which provides an estimate of the Wechsler Adult Intelligence Scale-III IQ scores for people between the ages of 16 to 89 years. The test consisted of 50 words that have irregular spelling and, therefore, are difficult to pronounce. For each word that is pronounced correctly, the individual is awarded 1 point, resulting in a maximum score of 50. An age-corrected scaled score was then obtained in accordance with the WTAR manual.

The WTAR showed adequate psychometric properties with internal consistency coefficients ranging from .90 to .97 in the U.S. standardised sample and from .87 to .95 in the U.K. sample (The Psychological Corporation, 2001). Adequate validity is shown in the high correlations with other measures of reading recognition, including .78 with the National Adult Reading Test (NART, Nelson, 1982), .90 with the American National Adult Reading Test (AMNART, Grober & Sliwinski, 1991), and .73 with the Reading subtest of the Wide Range Achievement Test-Revised (WRAT-R, Blair & Spreen, 1989). In the current study, a Cronbach's alpha coefficient of .91 was found.

Mania Screen

Young Mania Rating Scale (YMRS, Young, Biggs, Ziegler, & Meyer, 1978)

The YMRS is an 11-item measure, designed to screen for manic symptoms in the following areas: elevated mood, increased motor activity, energy, sexual interest, sleep, irritability, speech (rate and amount), language (thought disorder), content, disruptive-aggressive behaviour, appearance and insight. Most items in this scale were

rated on a scale from ‘0’ to ‘4’, except for items 5, 6, 8 and 9, which were given twice the weight, and were on a scale from ‘0’ to ‘8’. The scores on each item were summed to given a total score, which can range from 0 to 60. Higher scores on the YMRS indicate high levels of manic symptoms.

Adequate reliability and validity of the YMRS have been established in both adult (Young et al., 1978), and adolescent populations (Carlson et al., 2003). The YMRS has been described as the gold standard for evaluating concurrent validity of bipolar mania with newer mania scales (Altman, 2004). None of the participants met the criteria for mania during the time of testing, however 33% of the sample described a past history of manic episodes.

Procedure

Ethical approval for this study was given by the North Western Mental Health Research and Ethics Committee (see Appendix B), and this study was registered with the University of Melbourne Behavioural and Social Sciences Human Ethics Committee.

Each participant was given information about the study, and was required to consent to the study in writing (see Appendix C), before the protocol was conducted. They were required, also, to give permission for the researcher to be able to access and use data that had been obtained in the previous study. The protocol required the participants to complete a laptop computer task, and a number of pencil-and-paper tasks. The length of the protocol varied, however, it typically took between 30 and 45 minutes.

Statistical Analyses

The internal consistencies of the self-report measures used in the current study were first determined using Cronbach’s alpha. These alpha values have been included in the measure descriptions. Following this, data was screened by examining the means, standard deviations and assessing the assumption of normality for each variable. The relationship between the various self-report and neuropsychological measures of impulsivity was explored using correlational analyses (Pearson product moment correlations). Partial correlations were used to control for the potential influence of attention and executive functioning, as measured by the neuropsychological measures of the Stroop, Digit Span, and the WTAR.

Results

The results from the testing of the hypothesis for Study Two are presented below. The hypothesis in Study Two predicted that there would be a significant relationship between self-report and neuropsychological measures of 'rash impulsivity' and 'reward sensitivity'.

Data Screening

Most variables met the assumption of normality based on Tabachnick and Fidell's (2001) equation stating that skewness/standard error ratio should be less than three. As the data collected from the DDT task displays a hyperbolic curve, natural logarithms of *k* were used for this variable, in order to meet the assumption of normality. In addition, natural logarithms were able to reduce the impact of outliers on the Pearson correlation coefficient, without reducing the number of data points, as highlighted in Mitchell (1999). However, following this transformation, a single data point was found to be an extreme outlier, and therefore, as suggested by Tabachnick and Fidell (2001), this case was deleted, and not used in any further analyses. Summaries of the analyses that were carried out using the non-transformed DDT variable are provided in Appendix D. The basic summary statistics for valid scores from these impulsivity and control measures are shown in Table 15.

Table 15

Summary Statistics for Impulsivity and Control Variables

Variables[1]	N	Mean	Range	Standard Deviation	Skewness Statistic	Skewness Standard Error	Kurtosis Statistic	Kurtosis Standard Error
BAS	60	12.72	6-22	3.63	.20	.31	-.41	.61
BIS-11	59	78.61	47-107	11.65	-.07	.31	.29	.61
LG_DDT	59	-5.06	-13.65--.37	2.32	-.54	.31	2.86	.61
GoNo_N	60	18.75	0-30	8.01	-.61	.31	-.48	.61
GoNo_R	60	20.45	1-30	7.35	-.82	.31	.01	.61
GoNo_D	60	1.70	-13-13	4.57	-.09	.31	1.49	.61
Stroop	60	2.67	-11-18	6.49	.04	.31	-.06	.61
WTAR	60	31.32	13-46	8.66	-.20	.31	-1.03	.61
DS	60	14.07	8-23	3.16	.14	.31	-.06	.61

Notes. [1] BAS=Sensitivity to Reward, BIS-11=Barratt Impulsiveness Scale, LG_DDT=Delay Discounting Task, logarithm transformed, GoNo_N=Correct inhibition of red arrows in Neutral condition of go/no-go task, GoNo_R=Correct inhibition of red arrows in Reward condition of go/no-go task, GoNo_D=Difference in scores between conditions (Reward Score – Neutral Score), Stroop=Stroop Colour and Word Task, WTAR=Wechsler Test of Adult Reading, DS=Digit Span Task.

Relationships between Different Measures of Impulsivity

The hypotheses predicting a significant relationship between self-report and neuropsychological measures of 'rash impulsivity' and 'reward sensitivity' was tested by examining correlations between these different measures. Hierarchical multiple regressions were conducted based on the hypothesised relationships. The hypothesis predicted that the self-report score of 'rash impulsivity' (as measured by the BIS-11) would be predictive of go/no-go performance under neutral conditions, and the self-report score of 'reward sensitivity' (as measured by the SPSRQ) would be predictive of both the go/no-go performance under reward conditions and the scores on the DDT. The results from the simple bivariate correlational analysis between these variables are shown in Table 16.

Table 16 reported some noteworthy significant correlations between the different measures of impulsivity. The BAS was significantly positively correlated with the difference between the reward and neutral condition of the go/no-go tasks (r=.26, p<.05), and the DDT was significantly negatively correlated with the score on the reward condition of the go/no-go (r=-.26, p<.05). The correct inhibition scores on

the reward and the neutral conditions of the go/no-go were significantly positively correlated (r=.83, p<.01). Of the control variables, namely the Stroop, WTAR and DS, the only significant correlation with the impulsivity variables was the positive correlation between the scores on the WTAR and the BAS (r=.27, p<.05) measures. Within the control variables, only scores on the WTAR and DS measures were significantly associated, showing a significant positive correlation (r=.59, p<.01).

Although the control variables showed only a few significant correlations with the impulsivity variables, partial correlations were conducted in order to control for any potential influence that these variables may have on the results. The results from these analyses are shown in Table 17

Table 16

Correlational Matrix for Impulsivity Measures and Control Variables

Variable[1]	BAS	BIS-11	LG_DDT	GoNo_N	GoNo_R	GoNo_D	Stroop	WTAR	DS
BAS	1.00	.22	.16	-.22	-.08	.26*	.22	.27*	.02
BIS-11		1.00	.22	-.04	-.11	-.11	.13	.21	.17
LG_DDT			1.00	-.22	-.26*	-.03	.09	.10	.15
GoNo_N				1.00	.83**	-.42**	-.08	.10	.19
GoNo_R					1.00	.16	-.01	.13	.17
GoNo_D						1.00	.14	.03	-.06
Stroop							1.00	.18	.12
WTAR								1.00	.59**
DS									1.00

Notes. [1] BAS=Sensitivity to Reward, BIS-11=Barratt Impulsiveness Scale, LG_DDT=Delay Discounting Task, logarithm transformed, GoNo_N=Correct inhibition of red arrows in Neutral condition of go/no-go task, GoNo_R=Correct inhibition of red arrows in Reward condition of go/no-go task, GoNo_D=Difference in scores between conditions (Reward – Neutral), Stroop=Stroop Colour and Word Task, WTAR=Wechsler Test of Adult Reading, DS=Digit Span Task.

* p<.05. ** p<.01

Table 17

Correlational Matrix Following Partial Correlations of Stroop, WTAR and DS

Variable[1]	BAS	BIS-11	LG_DDT	GoNoN_Sc	GoNoR_Sc	GoNoD_Sc
BAS	1.00	.18	.16	-.22	-.10	.23
BIS-11		1.00	.19	-.06	-.15	-.13
LG_DDT			1.00	-.25	-.29*	-.03
GoNo_N				1.00	.82**	-.41**
GoNo_R					1.00	.18
GoNo_D						1.00

Notes. [1] BAS=Sensitivity to Reward, BIS-11=Barratt Impulsiveness Scale, LG_DDT=Delay Discounting Task, logarithm transformed, GoNo_N=Correct inhibition of red arrows in Neutral condition of go/no-go task, GoNo_R=Correct inhibition of red arrows in Reward condition of go/no-go task, GoNo_D=Difference in scores between conditions (Reward – Neutral).

* $p<.05$. ** $p<.01$

The significant positive correlation between BAS and the difference scores on the go/no-go was not sustained, when partial correlations were conducted to control for any potential influence of the Stroop, the WTAR and the DS. Also, small changes in the correlations occurred, including for the correlation between the DDT and the reward condition score of the go/no-go, which increased by .03 (r=-.29, p.>05).

In Study Two, hypothesis 1a stated that the self-report measure of 'rash impulsivity' (BIS-11) would be predictive of go/no-go performance under neutral conditions. The correct inhibition of red arrows score was used to represent go/no-go performance under neutral conditions. The correlational matrix shown in Table 16, did not show any significant correlations (r=-.04) between the BIS-11 and the go/no-go scores in the neutral condition. This was further confirmed in partial correlational analyses (shown in Table 17) when the effects of attention, and executive functioning were controlled for. Although value of the correlations increased slightly, the associations remained non-significant (r=-.06). Contrary to the hypothesis, none of the variables were found to be a significant predictor of BIS-11.

Hypothesis 1b stated that the self-report measure of 'reward sensitivity' (BAS) would be predictive of go/no-go performance under reward conditions. The

correlational matrix shown in Table 16, indicated a significant positive correlation between the BAS score and the difference in reward and neutral conditions on the go/no-go task (r=.26, p<.05). However, this significant positive correlation disappeared when the effects of attention and executive functioning were controlled for (see Table 17). Contrary to the hypothesis, none of the predicted variables were found to be predictive of BAS scores. Hypothesis 1c stated that the self-report measure of 'reward sensitivity' (BAS) would be predictive of scores on the DDT. The correlational matrix, displayed in Table 16, did not reveal any significant correlations between these variables. This was further confirmed by the results from the partial correlations (see Table 17). With the effects of attention, executive functioning and age were controlled for, the value of the correlation remained unchanged. Contrary to the hypothesis, the scores on the DDT were not predictive of BAS scores.

Hypothesis 1d stated that the two behavioural measures of 'reward sensitivity', namely, the DDT and the go/no-go performance under reward conditions, would be significantly positively correlated. As presented in Table 16, the DDT did not correlate with the difference between the reward and neutral scores. However, the DDT score was significantly negatively correlated to the correct inhibition of red arrows on the reward condition (r= -.26, p<.05), as higher scores on the DDT occurred when individuals discounted larger later rewards in favour of a smaller sooner alternative, indicating impulsivity. This was further confirmed when, with the effects of age, attention and executive functioning controlled for (see Table 17), the correlations between these two variables remained significant (r=-.29, p<.05).

Discussion

The hypothesis for Study Two, predicted specific relationships between the various measures of impulsivity. Results from investigations into this construct have confirmed that impulsivity is multifactorial, however there is debate in the literature regarding the number of factors. A recent review of factor analytical studies concluded that there were two main components in impulsivity, that is, 'reward sensitivity' and 'rash impulsivity'. 'Reward sensitivity' can be defined as a 'purposeful drive to obtain rewarding stimuli' (Dawe & Loxton, 2004), while 'rash impulsivity' is defined as 'the tendency to act rashly and without consideration of consequences' (Dawe & Loxton, 2004). In the current study, a self-report measure

(SPSRQ) of 'reward sensitivity' was compared with two behavioural tasks (go/no-go – reward and DDT) of 'reward sensitivity'. In addition, a self-report measure (BIS-11) of 'rash impulsivity' was compared with a behavioural task (go/no-go – neutral) of 'rash impulsivity'.

Contrary to the hypothesis, it was found that, after controlling for executive functioning and attention, neither of the self-report measures correlated with the behavioural tasks used. These results may be taken to indicate that the measures were not valid measures of the two components of impulsivity, namely 'reward sensitivity' and 'rash impulsivity'. Another possible interpretation is that impulsivity is not made up of these two components, rather that, there may be a number of different components within the construct of impulsivity. Not only could these tasks be measuring different components of the personality trait impulsivity, some of these measures, also, could be tapping into the individuals 'state' of impulsivity rather than the impulsivity 'trait'. For example, Schmidt (2003) has suggested that behavioural tasks may be measuring a 'state impulsiveness', as the tasks are conducted in an artificial environment, with specific elements being set up that are not guaranteed to ever be replicated in the 'real-world'. This may be particularly salient for the DDT, when the individual is deciding between different amounts of money. Thus, their financial situation at the time of the task could be hypothesised to have a significant impact on their reactions and choices.

It was found, also, that the self-report measures of impulsivity, that is, the SPSRQ and the BIS-11, did not significantly correlate with each other. This result provides support for the idea that these two questionnaires are measuring different aspects of the construct of impulsivity, as per the notion that impulsivity is a multifactorial construct. This finding suggests that when using self-report measures of impulsivity, it would be important for researchers not to rely solely on a single measure, as a significant amount of information that could be argued to represent impulsivity might be overlooked.

In this study, the behavioural tasks were significantly correlated. The neutral and the reward condition of the go/no-go tasks correlated significantly, however this was not surprising, as all other components of this task were identical, except that, in reward condition, participants were offered a monetary reward. The go/no-go reward condition and the DDT, also, were significantly correlated in this study, suggesting

that these two tasks were tapping into a similar component of impulsivity, specifically related to the reward component of the tasks. Further confirmation for this was found when the DDT was found not to be significantly correlated with the neutral condition of the go/no-go task, despite the fact that the DDT was highly correlated with the go/no-go reward condition.

Limitations of Study One and Study Two, as well as future directions for research, will be discussed in the next chapter.

CHAPTER FOUR
CONCLUDING DISCUSSION

There has been a significant amount of research conducted with respect to substance use behaviours and the risk and protective factors associated with SUD (Brook et al., 2001; Gilvarry, 2000; Howard & Jenson, 1998; Jenkins & Zunguze, 1998; Killen et al., 1997; Wills, Cleary et al., 2001; Wills, Sandy et al., 2001). However, this field is still relatively undeveloped, and lacks quality research that is able to bring these established factors together within a theoretical model, to account for the underlying mechanisms involved in the development of a SUD. This research aimed to address these shortcomings in two ways. Firstly, the relationship between a large number of risk factors for substance use was explored in a sample of young substance users, including the personality traits, of BAS (trait impulsivity) and BIS (trait anxiety), emotion-oriented, avoidance and task-oriented coping strategies; coping, enhancement and social motives for substance use, and positive and negative affect. Gray's (1970) Reinforcement Sensitivity Theory was used as the model of personality, as a first step in placing these risk factors within a specific theoretical model. Secondly, based on previous factor analytical studies, which had concluded that impulsivity is comprised of two main factors, namely 'reward sensitivity' and 'rash impulsivity', the construct of impulsivity was explored using a multimodal approach.

The aim of this final chapter is to integrate the findings from these two studies and to contribute to an understanding of the formation of SUD, by examining the contributions of the various risk factors. This chapter consists of five sections. Following this brief introduction, an integration of the results from Study One and Study Two is presented. Theoretical considerations are outlined with respect to the current research, followed by a review of the limitations of the research undertaken. Finally, the findings that were obtained, combined with theoretical considerations, were drawn on to propose future research directions in the substance use field.

Integration of Findings

Taken together, the findings from Study One and Two indicate that there is no clear and simple relationship between risk factors, and the development of a SUD. In

Study One, partial support for some of the hypothesised interactions was found, when relationships between four established risk factors of SUD and substance use outcome variables were investigated. A significant positive relationship was found between emotion-oriented coping and enhancement motives and substance use, indicating that some individuals use substances as a way of coping, by enhancing positive emotions. In addition, emotion-oriented coping was found to be predictive of cannabis use, signifying that individuals used cannabis as a way of coping with their emotional distress. Lower scores on BIS, and higher scores on avoidance coping, coping motives for use, and negative affect were found to significantly predict cannabis use after controlling for gender. This indicated that individuals used cannabis as a way of avoiding stressors, and coping with their negative feelings. The negative relationship between BIS and substance use, may be due to individuals with higher levels of BIS, being prone to increased arousal and movement away from undesired states, resulting in less exposure to risky situations, such as situations where substance use is more likely to occur. In addition, it was found that individuals who displayed an increased sensitivity to reward (elevated BAS levels) were motived to use alcohol as a means to obtain positive reinforcement via social interaction.

Although predictive relationships of multiple risk factors were found in the current study, there were a number of analyses where only a single risk factor was found to be predictive of substance use outcomes. Thus, for example, coping motives for use contributed unique variance to both alcohol use, and lifetime diagnoses, indicating that individuals use alcohol, and other substances as a way of coping with stressors in their lives. A further finding, that BAS scores were predictive of alcohol use, is consistent with previous research (Johnson et al., 2003; Jorm et al., 1999). This suggested that individuals, who display an elevated sensitivity to reward ('trait impulsivity'), use increased amounts of alcohol to obtain gratifying, positive feelings.

As a way to further clarify the construct of impulsivity, in the context of substance use, a multimodal method was utilised. When the various impulsivity measures were compared in Study Two, the self-report measures did not significantly correlate with any of the behavioural tasks, after controlling for attention and executive functioning. This suggested that these measures were not valid measures of the two identified components of impulsivity, namely 'reward sensitivity' and 'rash impulsivity'. It is possible that the construct of impulsivity is comprised of more than

two components, and the different measures used in this study were measuring only some of these. Alternatively, these measures could be tapping into the individuals' 'state' of impulsivity rather than the impulsivity 'trait', as discussed in Chapter Three. The lack of significant correlations found between the various measures of impulsivity was consistent with some studies, where low or non-significant correlations have emerged between different impulsivity measures (Dolan & Fullam, 2004). Nonetheless, as highlighted in Chapter One, other studies have found significant correlations between impulsivity measures (Reynolds et al., 2006).

In Study One, 'trait impulsivity' (as measured by the BAS) was found to be a predictor of substance use outcome, while the results from Study Two provided support for the multifactorial nature of impulsivity in a subset of the substance using sample. Taken together, these two sets of findings highlighted a number of issues with respect to the definition and measurement of impulsivity. Due to the multifaceted nature, it indicated that a single measure of impulsivity is not sufficient to encompass all the different components of this construct. Therefore, utilising a multimodal method of measurement will assist in understanding the impulsivity profile that is present in the population of interest, such as a substance using population. The present findings highlight the need for further investigation of the construct of impulsivity, to allow for more precise definition and measurement.

As highlighted above, there were a number of variables that were found to be predictive of substance use outcomes, both in isolation and in conjunction with other variables. In addition, there were some inconsistent results, with some predictions, regarding relationships between the substance use outcome measures and the established risk factors, not being supported. Possible reasons for the lack of hypothesised relationships are discussed below, in the theoretical considerations and limitations sections of this chapter.

Theoretical Considerations

The explication of the present findings requires a number of theoretical considerations to be taken into account. Major issues include, the need to define personality traits within a theoretical context, and the clarification of concepts, such as impulsivity and coping strategies. The complexity of the interrelationships between the various factors that contribute to the development of SUD in young people, make

it essential that a theoretical approach is used that takes account of the relevant interactions at play within the developmental context of SUD. In the current study, a measure relating to Gray's (1970; 1981) model of personality (RST) was used as the theoretical basis for the personality variables found to be important in substance use, and the relationships between these variables and substance use outcomes were explored.

Firstly, the current status of Gray's RST needs to be addressed. Although Gray's (1970; 1981) model of personality was developed approximately thirty years ago, there have been a number of changes from its original form, with the most recent revision proposed by Gray and McNaughton (2000). While addressing some criticisms of the original theory, the recent revision of RST raised new questions based on the available evidence, with respect to this theory of personality. For example, the significant change proposed in the BIS and FFFS roles within the RST, highlighted the need for clarification of the personality traits that specifically relate to these individual physiological systems (Corr, 2004). Corr's (2004) review posited that the current status of the theory described: (1) 'punishment sensitivity' as a combination of BIS/FFFS functioning, and (2) 'reward sensitivity' as the result of BAS functioning (as per the original theory). Future research into the RST will need to explicitly test these revisions, through the investigation of the relationships between these components, and the differences proposed in the revision of the theory at neurological and behavioural levels.

In addition, Gray and McNaughton's (2000) review stated that the role of the BIS was very specific, being activated only when conflicting goals are present, that is, resolving conflicts between the approach system (BAS), and the avoidance system (FFFS). Consistent with the revised model, Corr (2002; 2004) has shown that the BAS and BIS systems may in some situations work as joint subsystems, rather than orthogonally, as suggested in the original model. The significant positive correlation found between the BAS and BIS scores in the current study lends support for the notion of an overlap between these two systems. Further clarification of the interaction of these two systems, and the conditions that need to be met for them to act jointly, is necessary. In summary, further research needs to be conducted with respect to the RST, to help clarify the roles of the different systems and the function of the BAS and BIS personality traits.

Although there were clearly theoretical issues in applying Gray's (1970; 1981) model to SUD, the purpose of using a theoretical framework, such as this, was to advance the current status of the field. As emphasised in the first chapter, personality has been widely studied in an attempt to clarify the connection between specific traits and substance use, with the personality characteristics of neuroticism and impulsivity having been identified as important risk factors for the development of a SUD (Brook et al., 2001; Cooper et al., 2000; Pandina et al., 1992). However, without a theoretical model that places SUD within a context, the words 'neuroticism' and 'impulsivity' say very little about the development of the problem, and more importantly, give little direction with regards to treatment strategies.

Historically, the concept and measurement of neuroticism has been based on factor analyses of common adjectives used to describe certain behaviours. This has led to questions regarding the usefulness of this definition, and how well it contributes to the description of the aetiology of psychopathology (Ormel et al., 2004). The construct, as it currently stands, provides limited explanation about the psychological and biological mechanisms that underlie the concept of neuroticism (Ormel et al., 2004). Gray's (1970; 1981) BIS personality trait, overcomes some of these shortcomings, as the mechanisms underpinning this personality trait are explicitly expressed. The BIS, also conceptualised as 'punishment sensitivity', is hypothesised to regulate the experience of negative emotions, and ultimately causing movement away from undesired states.

Similar criticisms have been raised in relation to the construct of impulsivity, with research indicating that the psychological and biological mechanisms that underlie this construct are unclear (Milich et al., 1994; Moeller et al., 2001). Criticisms include: inconsistent definitions used in the clinical research literature, the lack of concurrent validity between various measures of impulsivity, and the lack of a theory-driven approach in research when using this construct (Milich et al., 1994; Moeller et al., 2001). Gray's (1970; 1981) BAS personality trait overcomes some of these criticisms by using a theory-driven approach, and by defining the specific type of impulsivity that it is testing. In this instance, the BAS is conceptualised as 'reward sensitivity', and regulates the experience of positive emotions causing direction towards desired end states, predisposing individuals to reward seeking behaviours and positive affect. These processes are seen to be particularly salient in a substance using

population, due to the 'rewarding' aspect of substance use and the suggested etiologic link between reward mechanisms in the brain, and SUD (Martin-Soelch et al., 2001).

Specific to the measurement of BAS, and, as highlighted in the integration of findings section of this thesis, there were queries regarding impulsivity measures tapping into the 'state' or 'trait' aspects of functioning. The SPSRQ was used in the current study to measure 'trait impulsivity', a stable personality trait, however it is uncertain whether this scale measures the 'state' or the 'trait'. Dolan and Fullam (2004) have asserted that the relevance of the BAS scale in 'trait' and 'state' impulsivity is not fully comprehended. The impulsivity literature will be benefited by exploring the relationship between self-report scales that measure this personality factor, and other psychometric and behavioural measures of impulsivity, resulting in further clarification of the relevance of the BAS, and its relationship with current notions of impulsivity.

A further theoretical consideration concerns the categorising of coping strategies. Based on theoretical suppositions, and observational studies, researchers have variously conceptualised and categorised ways that people cope with life stress. For example, Carver, Scheier and Weintraub (1989) described coping strategies as either, adaptive and maladaptive. Folkman and Lazarus (1984) differentiated emotion-focused coping, defined as the regulation of distressing emotions, and problem-focused coping, defined as doing something to change the problem causing the distress. Endler and Parker (1999) conceptualised problem-focused coping as having a *task* orientation, emotion-focused coping as having a *person* orientation, and avoidance coping, defined as being aimed at avoiding the stressful situation.

A core problem with the research surrounding these coping strategies is the number of ways that coping strategies can be categorised. This has resulted in a number of measures being used to assess this coping concept. Therefore, the same activity that an individual might use to cope with stressors in their life could be grouped in a variety of ways. For instance, the coping strategy of avoiding a problem task, by doing another active task, can either be categorised as an avoidance, maladaptive, emotion-focused or task-oriented coping strategy. This conceptual confusion makes interpretation of empirical findings difficult, and further research and clarification in this area is necessary.

Treatment Implications

One of the aims of conducting research within clinical populations is to ascertain more effective treatment methods. Early intervention and prevention is imperative in order to reduce the disruption to a person's functioning, and to have minimal impact on the developmental process during adolescence. As such, it is important to highlight how the findings from the current study could contribute to current knowledge about substance use, and ways to translate this knowledge to treatment strategies. The present findings suggest that assessment of the reasons individuals' use substances would be an important step to achieve this goal. This information can then be used to help individuals with these issues, with a specific treatment intervention aimed at reducing or eliminating their reasons behind their substance use.

Current treatment programs tend to be multimodal, and many of them currently include participants learning new skills, in individual (Sampl & Kadden, 2001) or group settings (Katz, Sears, Adams, & Battjes, 2003). Strategies used in substance use treatment include; enhancing positive experiences, problem solving, affect management, and coping with relapse, to name a few. Findings from this study, that relate coping and motives for use, support the continued inclusion of these strategies in the treatment of SUD. Firstly, emotion-oriented and avoidance coping both emerged as predictors of substance use behaviours. One interpretation of the findings of self-reported reliance on emotion-oriented coping strategies, is that substances might be used as a way of regulating distressing emotions, with the act of using substances being understood as an emotionally based way of dealing with problems. Therefore, if individuals are more likely to utilise substance use as a means of escape or as an emotional method to cope with stressors on their life, then they might be at greater risk of developing substance use problems. This relationship might be stronger for those individuals with higher levels of stress to cope with in their lives. Secondly, the use of avoidance coping by substance users can be interpreted in a similar way, with individuals using substances as a way of avoiding their thoughts and emotions. Thirdly, the diminished levels of task-oriented coping found in this substance using sample, indicate that they use less problem solving and less active coping strategies to deal with stressors, compared with the normative sample. The present findings are consistent with previous research, which has shown individuals

who engage in more task-oriented coping and less in avoidance coping were less likely to develop substance use problems, and had greater success in recovery attempts (Cooper et al., 1988; Finney & Moos, 1995).

The above findings on coping have specific implications in treatment settings. Initially, coping measures can be used to investigate which strategies an individual would be more likely to use, when faced with stressors in their life. Following this, individuals can be taught more adaptive ways of avoiding situations, and to cope with their emotions, in conjunction with teaching newer, more active, task-oriented coping skills, to deal directly with stressors. Learning how to cope with stress involves the acquisition of different skills, resulting in broadening the array of coping strategies that an individual has available to them. Empirical support can be found for this process of teaching new coping strategies.

While determining motives for substance use is less explicitly stated in treatment manuals (Katz et al., 2003; Sampl & Kadden, 2001), it is implicit in strategies such as goal setting, which identifies a range of interpersonal, and intrapersonal stressors and triggers for substance use. The findings from this study, with respect to motives for use, indicate that coping and enhancement motives were more frequently cited in this substance using sample. In reference to coping motives, treatment strategies that target ways of learning how to cope with negative feelings would be beneficial, as indicated above, In addition, teaching ways to enhance pleasure and positive affect without the use of substances would be useful. If the first step in a treatment program was to investigate what motivates a client to use substances, then a specific treatment plan could be developed for this individual, based on this information. Galen (2001) highlighted that the efficacy for treatment approaches that focused on motives or expectancies were not known, due to the lack of outcome research within this area. However, there is evidence that individuals' alcohol expectancies can change over time (Brown, Carrello, Vik, & Porter, 1998), and a reduction in the effect of this substance use risk factor, may help reduce the chance of developing or maintaining a SUD. Further research will need to be conducted to substantiate this claim.

In summary, the present findings provide support for more emphasis on coping and motives for use in treatment, and that this should be client focused, based on the current needs of the presenting individual. Although the treatment plan may

involve general strategies that can be taught generically, such as anger management, relaxation training and assertiveness training, this treatment regime needs to be tailored to suit the individual needs of the client for any newly acquired strategies to be effective. Multiple risk factors, their relationship with one another, and the complex nature of these interactions, pose challenges for intervention and prevention strategies.

Limitations of the Study

A number of methodological shortcomings of the present study restricted the conclusions that can be made. A major limitation of this study was the cross-sectional nature of this research, which did not allow investigators to identify temporal associations. Therefore, cause and effect between the factors and their interactions, in terms of the course and the formation of a SUD, could not be examined.

A further methodological limitation of this study was the reliance on retrospective self-reporting to obtain a significant proportion of the information collected about the participants. Self-report measures used in this study included, specific information about the amount of substance used, as well as subjective experiences, such as motives for substance use, coping strategies, and recent affect. In addition to the problems found with accurate recall of substance use, recent research has indicated that accurate recall of other constructs, such as coping, stressors and affect is questionable at best (Ptacek, Smith, Espe, & Raffety, 1994; Shiffman, 2000). The TLFB method used, to measure quantities of substance use, has been to provide an adequate measure of alcohol use (Sobell & Sobell, 1996), however, research has shown, also, that individuals differ greatly in the amount of information that they can recall about their substance use (Carney, Tennen, Affleck, del Boca, & Kranzler, 1998; Searles, Helzer, & Walter, 2000). These studies raised questions about the validity of an individuals' ability to recount information about, both, the specific substances that they have used, as well as the determinants of use.

The use, in the present study, of participants that were in a treatment setting may have resulted in an over-sampling bias (Sher et al., 1999). It was likely that the participants sampled experienced the most severe substance use problems, and had significant additional comorbid psychopathology. Information regarding comorbidity of other mental or physical health issues was not collected in this study, and thus, was

not able to be controlled for. However, this sample was highly likely to have comorbid problems, as high comorbidity between SUD and other psychiatric disorders has been extensively documented in both adults (Brooner, King, Kidorf, Schmidt, & Bigelow, 1997; Flynn, Craddock, Luckey, Hubbard, & Dunteman, 1996; Kantojarvi et al., 2006) and adolescents (Greenbaum, Foster-Johnson, & Petrila, 1996; Rounds-Bryant, Kristiansen, Fairbank, & Hubbard, 1998). For example, findings obtained from a community sample reported 76% of adolescents with a SUD had a co-occurring mood, anxiety or disruptive behaviour disorder (Kandel et al., 1999). It has been noted, also, that samples obtained from residential treatment facilities exhibit distinct personality profiles, including lower levels of extraversion and higher levels of neuroticism (Eysenck & Gudjonsson, 1989). If individuals in a given treatment setting are found to have characteristic personality profiles, this would have implications for the generalisability of these findings. This is unlikely to have affected the current sample, as none of the participants were living in long-term residential facilities, however, it may be beneficial for future studies to investigate and distinguish the different treatment settings and living conditions of participants, to control for any differences.

Another limitation was the combining of data across genders, with gender differences having been reported in some previous studies. Existing findings suggest that women higher in neuroticism may be predisposed to alcohol disorders (Byrne et al., 1994; Khan et al., 2005), and that males and females may use different coping strategies (Endler & Parker, 1999). In the current study, due to the diminished sample size that would have resulted from analyses by gender, it was not possible to group gender separately. Gender was controlled for in the various hierarchical multiple regressions undertaken, by entering this variable in the first step of each analysis.

The failure to incorporate measures of all established risk or protective factors for SUD identified in the literature, including, for example, family history of substance use, peer substance use, low socioeconomic status and family support, constitutes a further limitation of the current study. However, the four established risk factors examined, namely personality, coping strategies, motives for use and affect, have strong empirical support in substance use research. Nonetheless, it must be acknowledged that due to only a small number of factors being examined, possible influences of other factors were not able to be determined in this study.

Further methodological limitations arose from the choice of measurement tools used to assess some key variables. The substance use outcome measure used to assess cannabis use was 'standard' cones. Although a 'standard' cone has been described in detail, and was identified as a widely recognised measure of cannabis use in Australia (Kavanagh & Saunders, 1999), as currently defined, it makes no allowance for the differences in drug potency. For example, hydroponic and non-hydropenic cannabis will differ in strength and potency. However, unless a sample of the cannabis that the individual used was available for testing, it would be extremely difficult to measure potency in a self-report questionnaire. While measuring the strength of the cannabis was not a feasible option in this study, it should be acknowledged as a limitation.

A further measurement issue emerged in relation to the assessment of affect. Firstly, affect could have been influenced by a number of variables, such as relationship issues, financial worries, or death of a loved one, which were not controlled for. Secondly, as highlighted in Chapter One, it may have been more beneficial to specifically measure mood expectancies following drug use, rather than affect experienced over the past week. It may be more important to find out the change in mood that the individual expected to experience, as a result of using substances, such as an increase in positive mood, or a decrease in negative mood. This information might provide more insight into the specific reasons behind substance use. As the data for this study was obtained from a clinical treatment population, individuals were more likely to have negative feelings about their current use, however they may still continue to expect the use of the substance to reduce negative affect, or be searching for the positive feelings that they felt on initial use.

A further methodological shortcoming was the measurement tool used in the assessment of Gray's (1970; 1981) RST personality traits. A range of diverse measures have been used to assess the BAS and BIS. For instance, Carver and White's (1994) BIS/BAS scale (Franken, 2002; Johnson et al., 2003; Jorm et al., 1999), the SPSRQ (Torrubia et al., 2001), as used in the current study, and Franken et al., (2006) used a factor analytic combination of both the SPSRQ (Torrubia et al., 2001) and Carver and White's (1994) BIS/BAS Scale. Although these measures are all theorised to be measuring the same construct, it is possible that this is not the case. The major difference between the SPSRQ (Torrubia et al., 2001) and the Carver and

White (1994) BIS/BAS Scale, is that the latter divides 'trait impulsivity' (BAS) into three different subscales, namely BAS Reward Responsiveness, BAS Fun-seeking and BAS Drive. As such, there was disagreement regarding the factor structure of these BAS scales, as to whether separate subscales exist in this 'trait impulsivity' construct (O'Connor et al., 2004; Smillie, Jackson, & Dalgleish, 2006). It is possible that by including Carver and White's (1994) BAS subscales, a broader assessment of impulsivity would have been possible. Furthermore, as much of the research has highlighted that impulsivity is multifaceted, using a different scale of impulsivity in Study One, such as the BIS-11 (which was utilised in Study Two), would have resulted in a more thorough assessment of this construct. Therefore, using a tool that only measured a single facet of impulsivity (BAS) scale could be viewed as a limitation.

A criterion for inclusion in this study was that an individual was seeking treatment for substance misuse of any substance. The purpose of grouping together individuals that were using a number of different drug types, was to address criticisms from previous research, indicating that the generalisability of the findings, from investigation of a single SUD, was restricted (Sher et al., 2000), however, this grouping created issues and limitations of its own. When alcohol and cannabis was examined independently in this study, different patterns of interactions emerged. By solely exploring alcohol or cannabis use, any impact of other substances that an individual was abusing, were essentially ignored. This is a general difficulty in substance use research, as many individuals (particularly in clinical populations) abuse multiple substances, as a personal choice, or due to external factors, such as cost and availability of the drug.

A further issue with this lack of drug specificity was the possible effect that this might have on the validity of the SDS measure. In the past, this measure has been utilised when investigating only one specific substance. It is not clear, if using this measure in a sample using different substances would have an effect on the reliability and validity. It was noted that the reliability alpha coefficient obtained in the current study of .66, was significantly lower than the alpha coefficient of .89 obtained in the development of the measure (Gossop et al., 1997). For similar reasons, the reliability and validity of the DUMM (Mueser et al., 1995) is queried. Previous research has indicted that while a number of motives for use are valid across the different drug

types (Simons et al., 2000; Simons et al., 2005), some motives can vary with respect to the specific substance that is being reported on (Teter et al., 2005). These findings indicate the results from the current study should be interpreted with caution.

In Study One, the absence of a 'normal' control group with which to explore and contrast the characteristics of the substance using sample, meant that the scores obtained for each individual risk factors were compared to available normative data. There were a number of limitations with this approach, which are summarised for the different comparisons below. Firstly, there was a concern about the validity of comparing data from the substance using sample with data from same normative samples, with respect to how well the normative data was representative of the population. The normative sample for the SPSRQ (Torrubia et al., 2001), for example, was comprised solely of Spanish undergraduates, a group that was unlikely to be representative of all individuals in this younger age group. Similarly for the PANAS and MASQ-SF measures, (Clark & Watson, 1991; Watson et al., 1988), the normative samples for both these measures comprised university undergraduates, enrolled in a variety of courses. As a consequence, results needed to be interpreted with caution.

Secondly, the validity of the comparisons with normative data were queried due to differences in ages. The normative sample for the coping measure (CISS, Endler & Parker, 1999) was obtained from an adult population who were aged 18 years or older (up to 60 years). The maximum age in the substance using sample was 30 years, resulting in a much lower mean age in this sample. Endler and Parker (1999) show that task-oriented coping significantly increases with age, therefore with respect to our population comparison, it was possible that the significantly reduced task-oriented coping strategies seen in the current sample, may have been due to the differences in age groups, rather than the fact that these individuals were a substance using sample. The changes that may occur with age in emotion-oriented and avoidance coping are less clear. By contrast, for the motives for use measure (DUMM, Mueser et al., 1995), the mean age of the normative sample of 17.3 years, was slightly younger than the substance using sample of 21.4 years, making comparisons between the two samples less reliable. However the random selection of the normative sample, indicated that it was representative.

A further issue arises from the finding in the normative data of the SPSRQ (Torrubia et al., 2001), that the scores on the BAS for males, differed significantly

from BAS scores for females, indicating that males have a higher baseline BAS score. This gender difference has not been replicated in normative samples of other BAS measures (Jorm et al., 1999). In the normative sample, there was a significant difference, also, between the BIS scores by gender, with females scoring higher than males, a result which has been supported by norms from other BIS measures (Jorm et al., 1999). In the present study, conclusions from these comparisons should be interpreted with caution.

One of the strengths of Study One was the number of participants that were recruited, resulting in a relatively large clinical sample for this area of research. However, Study Two only incorporated a smaller subset (n=60) of this original sample, therefore reducing the power of the findings for this study. In addition, measurement limitations arose in Study Two. For instance, when measuring 'reward sensitivity' on the go/no-go task, the difference between the performances on the neutral task compared with the reward task was used as the 'reward sensitivity' score. The rationale for using this calculated difference was to provide a baseline score to contrast any changes that occurred when a reward was offered. However, two limitations emerged when using this score in the analyses. Based on the factor analytic study by Dawe and colleagues (2004), predictions were made based on 'rash impulsivity' and 'reward sensitivity' being mutually exclusive. However, as highlighted in the theoretical considerations section of this chapter, it is not clear that this assumption holds true. Thus, if a large difference was not reported between these two scores, it may be due to elevated levels of both components of impulsivity, not because the individual was not sensitive to reward. Secondly, ceiling effects are inevitable with this measure, if someone was, both, low in 'rash impulsivity', and high in 'reward sensitivity'. Therefore, if an individual was not impulsive, and obtained a high score in the neutral condition, even if they were high in 'reward sensitivity', their performance on the reward condition could not demonstrate this, as they would be unable to improve on the higher scores they obtained in the neutral condition.

Another important point to note was the limitation associated with the Stroop measure that was used. The Stroop demonstrated the ability of an individual to sort and selectively react to information within their environment, essentially testing response inhibition and selective attention. However, the Stroop interference score has

been shown to be positively correlated with personality measures of Neuroticism and Extraversion in some (Helode, 1982), but not all studies (Daniel & Skoldackova, 1970). In the current study, however, no significant correlations were found between the Stroop and other variables. It seems likely that this finding is valid, and is not an effect of the personality traits that were investigated in the current study.

The number of limitations, both in the methodology of this research and within the status of the theoretical underpinnings of the key variables investigated, suggest that caution should be taken when interpreting these results, and determining the validity and generalisability of these findings. The implications of the present findings with respect to possible future research are discussed.

Recommendations for Future Research

The continued exploration of substance use in younger age groups is essential, as findings have shown that an early onset of problem substance use leads to more significant substance abuse problems in later life (Wills et al., 2000). This study has attempted to advance the current substance use literature in a number of ways. Firstly, it involved the examination of a number of risk factors, within a clinical substance using population. Incorporating a comprehensive range of risk factors, assists in obtaining a broader picture of the substance user, and the different aspects that may be influencing their substance use. Secondly, this study has highlighted the need for a theoretical framework. Gray's biological model of personality was used, with the aim to connect both neurological and personality research within the substance use field. Finally, this study has sought to continue the integral work of clarifying the construct of impulsivity, using both self-report and behavioural measures, within this clinical sample.

The present research can be drawn on to provide a basis for future investigations, incorporating a number of methodological and theoretical improvements. To begin with, comprehensive testing of the interrelationships between personality, coping strategies, motives for use, and affect, including the association between cause and effect, would require prospective longitudinal studies. Using a longitudinal strategy for research within younger populations has the advantage of eliminating any confounding effects that the chronicity of substance use might produce, and encourages a focus on early intervention and prevention.

Longitudinal research, also, will assist in untangling the issue highlighted by Schmidt (2003) regarding the use of behavioural and self-report measures to assess 'state' or 'trait' aspects of personality.

A further future methodological improvement is the inclusion of an age-matched control group. No such control group was present in this study, however, comparisons between groups would be useful to determine if the present clinical sample was a representative of substance using populations, and different from 'normals'. More comprehensive analyses would be possible with a larger sample, including the investigation into gender differences, found in some previous research (Byrne et al., 1994; Endler & Parker, 1999; Khan et al., 2005). In addition, a larger sample size would allow group comparisons of individuals using different substances, for example, groups that use alcohol only, cannabis only, heroin only, along with a group of poly-substance users. Sher (2000) suggested that investigating a single SUD restricted the generalisability of research findings, however grouping all the different substances together, created its own issues and limitations. Another possible alternative would be to group individuals together, who use specific substances based on the drug's effects, or the individuals' view of their effect. For instance, ecstasy, speed, LSD and cocaine might be grouped together, due to the fact that these drugs are more likely to be used as 'party' drugs (Greydanus & Patel, 2005), and to increase alertness (Teter et al., 2005). Using a larger sample size and comparing across substance use groups would allow the investigation into differential substance-related effects.

The research questions requiring future attention include, conceptualisation and definition of complex risk factors (such as impulsivity), the examination of the interactions of the various risk factors in the development of a SUD, and the incorporation of these interactions within a theoretical model. To gain a greater understanding of risk factors found to have a direct relationship to substance use, such as impulsivity, it is important that future research does not rely solely on a single measure, which assesses a narrowly defined construct. An alternative approach might be to use a multidimensional model of personality, which would allow findings to be interpreted in the context of a well established factor structure of personality.

Further investigation is needed to incorporate the interactions of the various risk factors within a theoretical model. The foundations for this future research were

set in this study, by using Gray's (1970; 1981) RST model of personality, with some positive results, including findings indicating the BAS and BIS traits were predictive of substance use. There were, however, some inconsistent findings, and it is unclear whether this was due to shortcomings in this theory (as highlighted in the theoretical considerations section of this thesis). It is recommended that future research investigates different models of personality, as the basis for examining the role of various risk factors within this context.

In summary, future research needs to continue to draw on theory to account for the different interactions between risk and protective factors, to understand the mechanisms underpinning the development of SUD, and to continue to improve on and learn from past research by addressing methodological shortcomings.

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APPENDICES

Appendix A: Measures Used in Study One and Study Two

Appendix A.1 Demographic Questionnaire

1	Gender	Male (1) Female (2)
2	What is your age?	
3	What is your ethnicity?	White/caucasian(1) Asian(2) African(3) ATSI(4) Middle east(5)
4	What level of education have you completed?	None(1) Primary(2) Secondary(3) University(4) Trade(5)
5	Are you currently employed?	Unemployed(1) school/study(2) semiskilled(3) unskilled(4)
6	What is your current housing situation?	Renting(1) DHS(2) Homeless(3) staying with friend(4) at home(5)
7	Have you ever left home? If yes at what age, for how long and where did you go?	Yes(1) No (2) <12 years(1) 12-18 (2) 18-25(3) <1 month (1) 1-12 months (2) permanently(3) agency(1) other family(2) friend(3) homeless(4)
8	Are your parents currently employed, if yes, what do they do?	Unemployed(1) not in work force(2) managerial/business(3) professional/para(4) semiskilled(5) unskilled(6)
9	At what age did you first try any drugs including cigarettes and alcohol?	_____
10	At what age did you begin drinking 4 or more times a day or using drugs (non experimental drug use) so that it began to interfere with your daily activities? eg school, work, friends etc	_____
11	Has any one in your family ever had a psychiatric illness?	Yes(1) No(2)
12	Has anyone in your family use hard drugs, such as heroin, cocaine, speed, uppers or downers or have a drug problem?	Yes(1) No(2)
13	Has anyone in your family drink alcohol so much that it became a problem? Eg getting into fights, couldn't get out of bed the next day, had difficulty keeping a job etc How often did this happen? _____	Yes(1) No(2) 1+ each week (1) 1+ each month (2) infrequently (3)

14	Who are your main social supports? Eg who do you turn to when you need someone? Describe _____	Parents(1) Other family(2) friends(3) organisational supports(4)

Appendix A.2 Structured Clinical Interview for DSM-IV (SCID-IV, First et al., 2001) – Substance Use Disorder Section.

SCID (E. Alcohol use disorders)

Screening questions.			
1	What are you drinking habits like? (How much do you drink? Has there ever been a time in your life when you had 5+ more drinks on one occasion?)		
2	When in your life were you drinking the most? Date: _____ How long did that period last?_____		
3	During that time… How often were you drinking? _____ What were you drinking? How much? _____		
4	During that time… did your drinking cause any problems for you?_____ did anyone object to your drinking? _____		
5	Does alcohol dependence seems likely? If yes go to Section on Alcohol Dependence (E4)	Yes	No
6	If any incidents of excessive drinking or any evidence of alcohol related problems continue with Alcohol Abuse (E2)	Yes	No
7	If never had any incidents or excessive drinking and there is no evidence of any alcohol related problems skip to 'Non-alcohol substance use disorders (E10)	Yes	No

?=inadequate information	1=absent	2=subthreshold	3=threshold/present

E2 ALCOHOL ABUSE							
Lifetime alcohol abuse	Alcohol abuse criteria						
Let me ask you a few more questions about the time when you were drinking the most or when it caused the most problems. During that time…	A. a maladaptive pattern of substance use leading to clinically significant impairment or distress, as manifested by 1+ of the following occurring within a 12 month period.						
Did you miss work or school because you were intoxicated, high or very hung over? How often? What about doing a bad job at work or failing subjects because of your drinking? If NO what about not keeping your house clean, taking proper car of your	(1) recurrent alcohol use resulting in a failure to fulfil major role obligations (work, school, home eg repeated absences, poor performance, neglect etc) _____ _____	?	1	2	3	F

children etc If YES How often? What period of time?						
Did you ever drink in situations in which it might have been dangerous to drink at all? eg driving, operating machinery If YES How many times? (When?)	(2) recurrent alcohol use in situations physically hazardous _____	?	1	2	3	F
Did your drinking get you into trouble with the law (eg arrests etc)? If YES How often? (for how long?)	(3) recurrent alcohol related legal problems _____	?	1	2	3	F
If not already known… Did your drinking cause problems with other people, family, friends, work colleagues etc? (Did you get into fights or bad arguments when drinking?) if YES did you keep on drinking anyway (for how long?)	(4) continued alcohol use despite having persistent/recurrent social or interpersonal problems caused/exacerbated by the effects of alcohol _____	?	1	2	3	F
At least one (A) item coded '3' (threshold/true) If alcohol dependence questions have not yet been evaluated and there is ANY possibility of physiological dependence or compulsive use GO TO E4. Alcohol Dependence OTHERWISE go to 'E10 Non alcohol use disorders.		1 or 3 Alcohol abuse ↓				

E4: ALCOHOL DEPENDENCE						
Lifetime alcohol dependence	Alcohol dependence criteria					
I'd now like to ask you some more questions about the time when you were drinking the most or when it caused the most problems. During that time…	A. a maladaptive pattern of substance use leading to clinically significant impairment or distress, as manifested by 3+ of the following occurring within a 12 month period.					
Did you often find that when you started drinking you ended up drinking much more than you were planning to? If NO what about drinking for much longer than you were planning?	(3) alcohol is often taken in larger amounts OR over longer periods of time than intended	?	1	2	3	F
Did you try to cut down or stop drinking alcohol? If YES did you ever actually stop drinking altogether? How many times did you try and stop? If NO did you want to stop/cut down? (Is this something you kept worrying about?)	(4) there is a persistent desire OR unsuccessful efforts to cut down/control alcohol use _____ _____ _____	?	1	2	3	F
Did you spend a lot of time drinking, being high or hung over?	(5) a great deal of tome is spent in activities necessary to obtain alcohol, use or recover from its effects.	?	1	2	3	F
Did you often have times when you would drink so often that you started to drink instead of working or spending	(6) important social, occupational or recreational activities reduced/given up because of alcohol use.	?	1	2	3	F

time with your family, friends, other activities eg sports, music etc						
If not already known… -Did your drinking cause any psychological problems like making you feel depressed, anxious, making it difficult to sleep, causing blackouts etc? Did your drinking cause/make worse any significant physical problems If YES to the above did you keep drinking anyway?	(7)alcohol use is continued despite knowledge of having a persistent or recurrent physical/psychological problem caused/exacerbated by alcohol	?	1	2	3	F
Did you find that you needed to drink a lot more in order to get the feeling you wanted more than you did when you first started drinking? if YES how much more? If NO what about finding that when you drank the same amount, it had much less effect than before?	(1) tolerance, as defined by either: (a) a need for markedly increased amounts of alcohol to achieve the desired effect (b) markedly diminished effect with continued use of the same amount of alcohol	?	1	2	3	F
Did you ever have any withdrawal symptoms when you cut down or stopped drinking like…. …sweating or racing heart …hand trembling …trouble sleeping …feeling nauseated/vomiting …feeling agitated? …feeling anxious (how about having a seizure, seeing/feeling/hearing things that weren't really there?) if NO did you ever start the day with a drink or often take a drink or some other medication/drug to keep yourself from getting the shakes or becoming sick?	(2) withdrawal, as manifested by either (a) 2+ of the following …autonomic hyperactivity …increased hand tremor …insomnia …nausea/vomiting …psychomotor agitation …anxiety (…grand mal seizures, transient visual/tactile/auditory hallucinations/illusions) (b) alcohol/substance taken to relieve or avoid withdrawal symptoms.	?	1	2	3	F
If unknown when did the symptoms above- coded 3 occur? Did they all happen around the same time?	At least 3 dependence items coded '3' (threshold/true) occurred within the same 12 months.	1 or 3				
If 1 circled – -Was alcohol abuse identified if YES do the alcohol abuse chronology (below) -Go on to screen Non alcohol use disorders E10. If 3 circled - -Do alcohol dependence chronology (below) -Go on to screen Non alcohol use disorders E10		Alcohol dependence ↓				

ALCOHOL USE CHRONOLOGY		
Circle whether criteria for abuse or dependence has been met	Abuse	Dependence

How old were you when you first had (abuse/dependence symptoms coded 3)? If unclear – during the past month have you had anything at all to drink?	Age at onset of abuse/dependence Criteria for alcohol abuse met at any time in past month?	_____ ? (unclear) 1 (past) 3 (current)	_____ ? (unclear) 1 (past) 3 (current)
If Dependence indicate: 1 – with/without physiological dependence (evidence of tolerance/withdrawal) _____ 2 – note the severity of dependence for worst week or past month _____ mild (few if any symptoms in excess of those required to make a diagnosis) moderate (symptoms/functional impairment between mild or severe) severe (many symptoms in excess of minimum diagnosis and markedly interfere with functioning.			
Go on to screen for Non alcohol use disorders E10			

SCID (Non alcohol use disorders)

E10: NON ALCOHOL USE DISORDERS - SCREENING		
Now I am going to ask you about your use of drugs or medicines. SHOW DRUG LIST TO SUBJECT Have you ever taken any of these to get high, to sleep better, to loose weight, to change your mood etc? Yes If YES continue No If NO discontinue		
For each drug group ever used:	Either (1) or (2):	
If street drug – when were you using drug X the most? (Has there ever been a time when you used it at least 10 times in one month?)	(1) has ever taken street drug 10+ times in a one month period. _____	
If prescribed drug – did you ever get hooked on a prescribed drug X or take much more of it than was prescribed?	(2) reports becoming dependent on a prescribed drug or using more of it than was prescribed	
If drug never used / only once / or prescribed drug used as directed circle 1 on table E11		1 (table E11)
If drug used 2+ but less than 10 times circle 2 on table E11		2 (table E11)
If drug used 10+ times or possibly dependent on prescribe ed drug circle 3 on table E11		3 (table E11)

E11: NON ALCOHOL USE DISORDERS – SCREENING CONTINUED					
Circle the name of each drug ever used	Record period of heaviest use (age, date, duration)	Indicate level of use (as described E10)			
Sedatives-hypnotics-anxiolytics (downers): Quaalude (ludes), Seconal (reds), valium, xanax, Librium, barbiturates, halcion, Restoril or other_____		?	1	2	3
Cannabis: marijuana, hashish, THC, grass, pot, weed, reefer or other _____		?	1	2	3

Stimulants (uppers): amphetamine (speed), crystal meth, dexadrine, Ritalin, ice, diet pills or other _____		?	1	2	3
Opioids: heroin, morphine, opium, methadone, Darvon, codeine, Percodan, Demerol, Dilaudid, unspecified or other _____		?	1	2	3
Cocaine: intranasal, IV, freebase, crack, speedball, unspecified or other _____		?	1	2	3
Hallucinogens/PCP (psychedelics): LSD (acid), mescaline, peyote, psilocybin, STP, mushrooms, PCP (angel dust), extasy, MDMA or other _____		?	1	2	3
Other: steroids, glue, paint, inhalants, nitrous oxide (laughing gas), amyl/butyl nitrate (poppers), non-prescription sleep or diet pills unknown/other _____		?	1	2	3
Any drug groups coded 2 or 3 ? If NO then discontinue. If YES the continue if NO drug were coded 3 only 2 then go to Substance Abuse E23 if there was a code 3 then go to Substance Dependence E12-13		No Yes			
If at least 3+ drug groups were used and a period of indiscriminate use seems likely ask: You've told me that you've used (X drug/ X alcohol). Was there a period where you were using a lot of different drugs at the same time and that it did not matter what you were taking as long as you could get high?	Behaviour during the same 12 month period involved the repeated use of 3+ substances but no single substance predominated. Further, during this period Dependence criteria were likely met for substances as a group but not for any specific substance. Therefore, code poly drug use in addition to specific drug columns				

?=inadequate information	1=absent	2=subthreshold	3=threshold/present

E12-13. NON ALCOHOL DEPENDENCE

Now I am going to ask you some specific questions about your use of Drugs X (ie coded 3)
Ask each question for each drug coded 3

Did you often find that when you started using drug X you ended up using more of it than you were planning to?
If NO what about using it over a much longer period of time than you were planning to?

DSM-IV Criteria	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
(3) the substance is often taken in larger amounts OR over a longer period of time than intended.	3	3	3	3	3	3	3	3
	2	2	2	2	2	2	2	2
	1	1	1	1	1	1	1	1
	?	?	?	?	?	?	?	?

Did you try to cut down or stop using Drug X?
if YES did you ever actually stop using drug X altogether?
How many times did you try? _____
if unclear – Did you want to stop/cut down? Is this something you kept worrying about?
_____

	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other

(4) there is persistent desire OR unsuccessful efforts to cut down or control substance use	3	3	3	3	3	3	3	3
	2	2	2	2	2	2	2	2
	1	1	1	1	1	1	1	1
	?	?	?	?	?	?	?	?
Did you spend a lot of time using drug X or doing whatever you had to do to get it? Did it take you a long time to get back to normal (how much time eg several hours?)?								
	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
(5) a great deal of time is spent in activities necessary to obtain the substance, use it or recover from it	3	3	3	3	3	3	3	3
	2	2	2	2	2	2	2	2
	1	1	1	1	1	1	1	1
	?	?	?	?	?	?	?	?
Did you often have times when you would use drub X so often that you used drug X instead of working or spending time on hobbies or with family, friends, work, other activities eg sport, music etc?								
	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
(6) important social, occupational, recreational activities were given up or reduced because of it	3	3	3	3	3	3	3	3
	2	2	2	2	2	2	2	2
	1	1	1	1	1	1	1	1
	?	?	?	?	?	?	?	?
If not already known: did drug X cause any psychological problems like making you depressed, agitated or paranoid? If not already known: did drug X cause/make worse any physical problems if YES to the above did you keep using the drug anyway?								
	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
(7) the substance use is continued despite having persistent/recurrent psychological/physical problems caused/exacerbated by the drug	3	3	3	3	3	3	3	3
	2	2	2	2	2	2	2	2
	1	1	1	1	1	1	1	1
	?	?	?	?	?	?	?	?
Did you find that you needed to use a lot more to get the same feeling you wanted than when you first started using? if YES how much more? _____ if NO what about finding that you used the same amount but it had less effect than before.								
	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
(1) tolerance as defined	3	3	3	3	3	3	3	3
(a) need for markedly increased amounts to achieve desired effect	2	2	2	2	2	2	2	2
	1	1	1	1	1	1	1	1
(b)markedly diminished effect with continued use of same amount	?	?	?	?	?	?	?	?
Did you ever have withdrawal symptoms, that is, felt sick when you cut down/stopped using drug X if YES what symptoms? (refer to list) if NO after not using the drug X for a few hours or more did you often use it to keep yourself from getting sick if NO what about using another drug when you were feeling sick so that you could feel better?								
	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
(2) Withdrawal, as manifested by either:	3	3	3	3	3	3	3	3
	2	2	2	2	2	2	2	2
(a)characteristic withdrawal syndrome	1	1	1	1	1	1	1	1
	?	?	?	?	?	?	?	?
(b) the same (or related) substance is taken to relieve/avoid withdrawal symptoms								
E19 Chronology for dependence								
Age of onset	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
How old were you when you first had								

drug X (for each drug coded 3)								
Meets criteria in past month If unclear – during the past month have you ever used drug X at all? If YES – Has your drug used caused any problems? (eg high when at school/work, missing something important, being too hung over, drink driving, getting into trouble with the law etc)								
	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
Full criteria for Dependence met during past month)	3	3	3	3	3	3	3	3
	1	1	1	1	1	1	1	1
No symptoms of Dependence or Abuse in past month (see E19 remission specifiers)								
E20 Type and severity of current dependence								
Indicate current type:	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
With current physiological dependence (evidence of tolerance/withdrawal)	3	3	3	3	3	3	3	3
	1	1	1	1	1	1	1	1
Without physiological dependence								
Indicate current severity	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
1= mild (few if any symptoms in excess)	3	3	3	3	3	3	3	3
	2	2	2	2	2	2	2	2
2=moderate	1	1	1	1	1	1	1	1
3=severe (many symptoms in excess of diagnosis and symptoms markedly interfere with functioning)								
E21. Remission specifiers For each drug coded '1' in E19 Chronology for dependence DOES NOT apply if: - criteria for dependence of abuse have been met in last month - if the individual is on agonist therapy or treatment in a controlled environment								
	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	poly	other
Early full remission	1	1	1	1	1	1	1	1
Early partial remission	2	2	2	2	2	2	2	2
Sustained full remission	3	3	3	3	3	3	3	3
Sustained partial remission	4	4	4	4	4	4	4	4
Tick if on agonist therapy								
Tick if in a treatment environment								

?=inadequate information	1=absent	2=subthreshold	3=threshold/present

E22-25. NON ALCOHOL ABUSE
For each drug coded '2' on E11 (ie drugs used at a level of <10 times in any one month. OR any drug that did not meet the criteria for dependence. Now I am going to ask you some specific questions about your use of these drugs XX (name those coded 2 in E11)
(A) A maladaptive pattern of substance use leading to clinically significant impairment or distress as manifested by 1+ occuring within 12 months When taking drug X at which period of time did it cause the most problems? _____

Did you miss school/work because you were high, hung over? How often? Did you do a bad job at school/work because of your use of drug X? if NO what about not keeping your house clean/taking care of yourself/child etc because of your drug use							
DSM-IV Criteria	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	other
(1) recurrent substance use resulting in a failure to fulfil major role obligations – work, home, school.	3	3	3	3	3	3	3
	2	2	2	2	2	2	2
	1	1	1	1	1	1	1
	?	?	?	?	?	?	?
Did you ever use drug X in a situation in which it might have been dangerous to be using it (eg drive when high) If YES how often? For how long?							
DSM-IV Criteria	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	other
(2) recurrent substance use in situations in which it is physically hazardous (driving, operating machinery etc)	3	3	3	3	3	3	3
	2	2	2	2	2	2	2
	1	1	1	1	1	1	1
	?	?	?	?	?	?	?
Did your use of drug X get you into trouble with the law? If YES how often? For how long?							
DSM-IV Criteria	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	other
(3) recurrent substance related legal problems	3	3	3	3	3	3	3
	2	2	2	2	2	2	2
	1	1	1	1	1	1	1
	?	?	?	?	?	?	?
If not already known Did your use of drug X cause problems with other people – family, friends, people at work? Did you ever get into physical fights/bad arguments about your drug use? If YES did you keep on using the drug X anyway. For how long?							
DSM-IV Criteria	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	other
(4) continued substance use despite having persistent or recurrent social or interpersonal problems caused/exacerbated by the effects of the drug	3	3	3	3	3	3	3
	2	2	2	2	2	2	2
	1	1	1	1	1	1	1
	?	?	?	?	?	?	?
E24 Substance abuse (lifetime)	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	other
At least one 'A' item (above) is coded 3	3	3	3	3	3	3	3
	1	1	1	1	1	1	1
E25 Age of onset	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	other
How old were you when you first had XXX (list all drugs coded 3 under dependence or abuse)							
E24 Use during the last month	Sed-Hyp	THC	Stim	Opioid	Cocaine	Hall	other

When was the last time you had problems with substance X (1=no abuse symptoms; 3 = symptoms in last month)	3	3	3	3	3	3	3
	1	1	1	1	1	1	1

END OF SCID

Appendix A.3 Timeline Followback (TLFB, Sobell & Sobell, 1992)

"I'm going to ask you about your drug and alcohol use and symptoms over the past 4 weeks"

Stressful Life Events

1. "Were there any events that happened during this time – like birthdays, accidents, anniversaries, parties – things like that" *(Note events in the upper right hand corner of the boxes).*
2. Have you started, stopped, changed or had any problems with …….in the past 4 weeks?
    a. School/Study
    b. Employment (include work conditions, promotion/demotion)
    c. Finances (include income, bills, loans, went on/off benefits)
    d. Relationships (include family/partner/friends/children/others)
3. Have you changed your living arrangements in the past 4 weeks?
    a. Living arrangements (include change in residence, new resident, renovations)
4. Have you increased or decreased your social activities over the past 4 weeks?
    a. Social activities (include social events, socialising with friends, organisations, vacations, hobbies, pets).
5. Have you had any problems with health or crime and legal matters in the past 4 weeks?
    a. Health (include physical health/illness/injury, contact with health professionals).
    b. Crime and Legal Matters (include victim of sexual assault/robbery, accidents, law suit, committed/accused of any crime).

"Not I'm going to ask you about your drug and alcohol use over the past 4 weeks"

Substance	In the past 4 weeks have you had any…..(Circle those that apply) Alcohol, Cannabis/Marijuana/Hash, Speed, Cocaine, Ecstasy, Crack, Heroin/Morphine or Methadone, LSD, Sleeping tablets of sedatives (e.g. valium or normison), Drugs you sniff, like petrol/glue, Other?
Type	What type of substance: Cannabis?: Leaf, heads/buds, skunk, hash/resin
Route of Administration	How did you use it?: smoked (joint or bong)/inhaled, mouth/eating, snort/sniffed, IV.
Quantity	How much did you use?: Cannabis – cones/joints/spliffs Speed/Coacaine/Heroin/Morphine/Mehadone – grams/mls/hits/tablets Sleeping tablets/Sedatives – tablets/mgs Alcohol – Standard units
Frequency	Number of times used per day?

Appendix A.4 Severity of Dependence Scale (SDS, Gossop et al., 1995)

SEVERITY OF DEPENDENCE SCALE (SDS)

Q: During the past 12 months... (use the most problematic drug in this section)

1. Did you ever think your use of (drug) was out of control?

Never or almost never	0
Sometimes	1
Often	2
Always or nearly always	3

2. Did the prospect of missing a smoke, fix (or dose) or not chasing, make you anxious or worried?

Never or almost never	0
Sometimes	1
Often	2
Always or nearly always	3

3. How much did you worry about your use of (drug)?

Not at all	0
A little	1
Quite a lot	2
A great deal	3

4. Did you wish you could stop?

Never or almost never	0
Sometimes	1
Often	2
Always or nearly always	3

5. How difficult would you find it to stop or go without drugs?

Not difficult	0
Quite difficult	1
Very difficult	2
Impossible	3

SDS TOTAL: _____

Appendix A.5 Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ, Torrubia et al., 2001)

Answer each question by placing a cross (in the circle for each question. There are no right or wrong answers, or trick questions. Work quickly and don't think too much about the exact meaning of the question. **Remember to answer ALL the questions and to give only ONE response to each question.**

	YES	NO
1. Do you often not do something because you are afraid of it being illegal?	**1**	**2**
2. Does the possibility of receiving money motivate you strongly to do some things?	**1**	**2**
3. Do you prefer not to ask for something when you are not sure you will get it?	**1**	**2**
4. Are you motivated to do something by the possibility of being valued for what you do, in your studies, with your friends or with your family?	**1**	**2**
5. Are you often afraid of new or unexpected situations?	**1**	**2**
6. Do you often meet people that you find physically attractive?	**1**	**2**
7. Is it difficult for you to telephone someone you do not know?	**1**	**2**
8. Do you like to take some drugs because of the pleasure you get from them?	**1**	**2**
9. Do you often give in if it will avoid a quarrel with a person or an organization?	**1**	**2**
10. Do you often do things to be praised?	**1**	**2**
11. As a child were you troubled by punishments at home or in school?	**1**	**2**
12. Do you like being the centre of attention at a party or social meeting?	**1**	**2**
13. In tasks that you are not prepared for, do you often worry about the possibility of failure?	**1**	**2**
14. Do you spend a lot of your time on having a good image?	**1**	**2**
15. Are you easily discouraged in difficult situations?	**1**	**2**
16. Do you need people to show their affection for you all the time?	**1**	**2**
17. Are you a shy person?	**1**	**2**
18. When you are in a group, do you try to make your opinions intelligent or the funniest?	**1**	**2**
19. Whenever possible, do you avoid doing a task for fear of being embarrassed?	**1**	**2**
20. Do you often take the opportunity to pick up people you find attractive?	**1**	**2**
21. When you are in a group, do you have difficulties selecting a good topic to talk about?	**1**	**2**
22. As a child, did you do a lot of things to get people's approval?	**1**	**2**
23. Is it often difficult for you to fall asleep when you think about things you have done or must do?	**1**	**2**
24. Would you do things, even if this involves unfair playing, to move up in your job?	**1**	**2**
25. Do you think a lot before complaining, eg in a restaurant if your meal is not good?	**1**	**2**
26. Do you generally give preference to those activities that you get an immediate gain?	**1**	**2**

27. Would you be bothered if you had to return to a store if you were given the wrong change?	**1**	**2**
28. Do you often have trouble resisting the temptation of doing forbidden things?	**1**	**2**
29. Whenever you can, do you avoid going to unknown places?	**1**	**2**
30. Do you like to compete and do everything you can to win?	**1**	**2**
31. Are you often worried by things that you said or did?	**1**	**2**
32. Is it easy for you to link tastes and smells to very pleasant events?	**1**	**2**
33. Would it be difficult for you to ask your boss for a raise (salary increase)?	**1**	**2**
34. Are there a large number of objects or sensations that remind you of pleasant events?	**1**	**2**
35. Do you generally try to avoid speaking in public?	**1**	**2**
36. When you start to play a poker machine, is it often difficult for you to stop?	**1**	**2**
37. Do you, often, think that you could do more things if it was not for your insecurity or fear?	**1**	**2**
38. Comparing yourself to people you know, are you afraid of many things?	**1**	**2**
39. Does your attention easily stray from your work in the presence of an attractive stranger?	**1**	**2**
40. Do you often worry about things to the extent that you don't do a task or think very well?	**1**	**2**
41. Would you do risky jobs for money?	**1**	**2**
42. Do you often stop doing things you like because you fear being rejected or disapproved of by others?	**1**	**2**
43. Do you like to put competitive ingredients in all your activities	**1**	**2**
44. Generally, do you pay more attention to threats than to pleasant events?	**1**	**2**
45. Would you like to be a socially powerful person?	**1**	**2**
46. Do you often stop doing something because of your fear of being embarrassed?	**1**	**2**
47. Do you like showing your physical abilities even though this may involve danger?	**1**	**2**

Appendix A.6 Coping in Stressful Situations (CISS, Endler & Parker, 1999)

The following are ways people react to various difficult, stressful or upsetting situations. Please circle a number from 1 to 5 for each item. Indicate how much you engage in these types of activities when you encounter a difficult, stressful or upsetting situation. Use this scale

		Not at all	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**
1	Schedule my time better	1	2	3	4	5
2	Focus on the problem and see how I can solve it	1	2	3	4	5
3	Think about the good times I've had	1	2	3	4	5
4	Try to be with other people	1	2	3	4	5
5	I often find myself for putting things off	1	2	3	4	5
6	Do what I think is best	1	2	3	4	5
7	Become preoccupied with aches and pains	1	2	3	4	5
8	Blame myself for having gotten into this situation	1	2	3	4	5
9	Window shop	1	2	3	4	5
10	Outline my priorities	1	2	3	4	5
11	Try to go to sleep	1	2	3	4	5
12	Treat myself to a favourite food or snack	1	2	3	4	5
13	Feel anxious about not being able to cope	1	2	3	4	5
14	Become very tense	1	2	3	4	5
15	Think about how I solved similar problems	1	2	3	4	5
16	Tell myself that it is really not happening to me	1	2	3	4	5
17	Blame myself for being too emotional about the situation	1	2	3	4	5
18	Go out for a snack or meal	1	2	3	4	5
19	Become very upset	1	2	3	4	5
20	Buy myself something	1	2	3	4	5
21	Determine a course of action and follow it	1	2	3	4	5

		Not at all	A little bit	Moderately	Quite a bit	Extremely
22	Blame myself for not knowing what to do	1	2	3	4	5
23	Go to a party	1	2	3	4	5
24	Work to understand the situation	1	2	3	4	5
25	“Freeze” and not know what to do	1	2	3	4	5
26	Take corrective action immediately	1	2	3	4	5
27	Think about the event and learn from my mistakes	1	2	3	4	5
28	Wish that I could change what had happened or how I felt	1	2	3	4	5
29	Visit a friend	1	2	3	4	5
30	Worry about what I am going to do	1	2	3	4	5
31	Spend time with a special person	1	2	3	4	5
32	Go for a walk	1	2	3	4	5
33	Tell myself that it will never happen again	1	2	3	4	5
34	Focus on my general inadequacies	1	2	3	4	5
35	Talk to someone whose advice I value	1	2	3	4	5
36	Analyse my problem before reacting	1	2	3	4	5
37	Phone a friend	1	2	3	4	5
38	Get angry	1	2	3	4	5
39	Adjust my priorities	1	2	3	4	5
40	See a movie	1	2	3	4	5
41	Get control of the situation	1	2	3	4	5
42	Make an extra effort to get things done	1	2	3	4	5
43	Come up with several different solutions	1	2	3	4	5
44	Take some time off and get away from the situation	1	2	3	4	5
45	Take it out on other people	1	2	3	4	5
46	Use the situation to prove that I can do it	1	2	3	4	5
47	Try to be organised so I can be on top of the situation	1	2	3	4	5
48	Watch TV	1	2	3	4	5

Appendix A.7 Drug Use Motives Measure (DUMM, Mueser et al., 1995)

Now I'm going to read a list of reasons people use drugs or alcohol. Thinking of all the times you use…..…*(use the most problematic drug in this section)*, how often would you say that you use for each of the following reasons? *(Circle one item for each reason).*

		Almost never/ Never	**Some of the time**	**Half of the time**	**Most of the time**	**Almost always/ Always**
1.	To relieve boredom	1	2	3	4	5
2.	To help you sleep	1	2	3	4	5
3.	To help you think more clearly	1	2	3	4	5
4.	To be sociable	1	2	3	4	5
5.	To relax	1	2	3	4	5
6.	To fit in with a group you like	1	2	3	4	5
7.	To get high	1	2	3	4	5
8.	To feel less suspicious or paranoid	1	2	3	4	5
9.	To forget about your problems	1	2	3	4	5
10.	Because it's fun	1	2	3	4	5
11.	To reduce side effects of medication	1	2	3	4	5
12.	Because it makes social gatherings more fun	1	2	3	4	5
13.	Because it helps you enjoy a party	1	2	3	4	5
14.	To get away from the voices	1	2	3	4	5
15.	Because you feel more self-confident and sure of yourself	1	2	3	4	5
16.	Because it helps when you feel depressed or nervous	1	2	3	4	5
17.	Because it's what most of your friends do when you get together	1	2	3	4	5
18.	Because you like the feeling	1	2	3	4	5
19.	To deal with anger	1	2	3	4	5
20.	To help you concentrate	1	2	3	4	5
21.	Because your friends pressure you to do it	1	2	3	4	5
22.	To be liked	1	2	3	4	5
23.	So you won't feel left out	1	2	3	4	5
24.	To celebrate a special occasion with friends	1	2	3	4	5
25.	To forget your worries	1	2	3	4	5

		Almost never/ Never	Some of the time	Half of the time	Most of the time	Almost always/ Always
26.	Because it gives you a pleasant feeling	1	2	3	4	5
27.	To give you more energy	1	2	3	4	5
28.	Because it's exciting	1	2	3	4	5
29.	To cheer you up when you are in a bad mood	1	2	3	4	5
30.	To feel less worried about what others are saying about you	1	2	3	4	5
31.	To help you lose weight	1	2	3	4	5
32.	Because you can't stop yourself	1	2	3	4	5
33.	Because your parents do	1	2	3	4	5
34.	To forget your past	1	2	3	4	5
35.	To avoid getting sick if you stop doing it	1	2	3	4	5
36.	So it's easier to take risks	1	2	3	4	5
37.	SO that others won't kid you about not doing it	1	2	3	4	5
38.	Because it's a habit	1	2	3	4	5
39.	To be creative	1	2	3	4	5
40.	Because people tell you not to	1	2	3	4	5
41.	To feel better about yourself	1	2	3	4	5
42.	To hurt yourself	1	2	3	4	5
43.	Because it improves parties and celebrations	1	2	3	4	5

Appendix A.8 Positive and Negative Affect Scale (PANAS, Watson et al., 1988)

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that work. Indicate to what extent you are feeling this way **in the past WEEK.**

		Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
1.	Interested	1	2	3	4	5
2.	Distressed	1	2	3	4	5
3.	Excited	1	2	3	4	5
4.	Upset	1	2	3	4	5
5.	Strong	1	2	3	4	5
6.	Guilty	1	2	3	4	5
7.	Scared	1	2	3	4	5
8.	Hostile	1	2	3	4	5
9.	Enthusiastic	1	2	3	4	5
10.	Proud	1	2	3	4	5
11.	Irritable	1	2	3	4	5
12.	Alert	1	2	3	4	5
13.	Ashamed	1	2	3	4	5
14.	Inspired	1	2	3	4	5
15.	Nervous	1	2	3	4	5
16.	Determined	1	2	3	4	5
17.	Attentive	1	2	3	4	5
18.	Jittery	1	2	3	4	5
19.	Active	1	2	3	4	5
20.	Afraid	1	2	3	4	5

Appendix A.9 Mood and Anxiety Symptom Questionnaire – Short Form (MASQ-SF, Clark & Watson, 1991)

Below is a list of feelings, sensations, problems, and experiences that people sometimes have. Read each item and then mark the appropriate choice in the space next to that item. Use the choice that best describes how much you have felt or experienced things this way during the past week, including today. Use this scale when answering:

		Not at all	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**
1.	Felt sad	1	2	3	4	5
2.	Startled easily	1	2	3	4	5
3.	Felt cheerful	1	2	3	4	5
4.	Felt afraid	1	2	3	4	5
5.	Felt discouraged	1	2	3	4	5
6.	Hands were shaky	1	2	3	4	5
7.	Felt optimistic	1	2	3	4	5
8.	Had diarrhea	1	2	3	4	5
9.	Felt worthless	1	2	3	4	5
10.	Felt really happy	1	2	3	4	5
11.	Felt nervous	1	2	3	4	5
12.	Felt depressed	1	2	3	4	5
13.	Was short of breath	1	2	3	4	5
14.	Felt uneasy	1	2	3	4	5
15.	Was proud of myself	1	2	3	4	5
16.	Had a lump in my throat	1	2	3	4	5
17.	Felt faint	1	2	3	4	5
18.	Felt unattractive	1	2	3	4	5
19.	Had hot or cold spells	1	2	3	4	5
20.	Had an upset stomach	1	2	3	4	5
21.	Felt like a failure	1	2	3	4	5
22.	Felt like I was having a lot of fun	1	2	3	4	5
23.	Blamed myself for a lot of things	1	2	3	4	5
24.	Hands were cold or sweaty	1	2	3	4	5
25.	Felt withdrawn from other people	1	2	3	4	5
26.	Felt keyed up, “on edge”	1	2	3	4	5
27.	Felt like I had a lot of energy	1	2	3	4	5
28.	Was trembling or shaking	1	2	3	4	5
29.	Felt inferior to others	1	2	3	4	5

30.	Had trouble swallowing	1	2	3	4	5
31.	Felt like crying	1	2	3	4	5
32.	Was unable to relax	1	2	3	4	5
33.	Felt really slowed down	1	2	3	4	5
34.	Was disappointed in myself	1	2	3	4	5
35.	Felt nauseous	1	2	3	4	5
36.	Felt hopeless	1	2	3	4	5
37.	Felt dizzy of lightheaded	1	2	3	4	5
38.	Felt sluggish or tired	1	2	3	4	5
39.	Felt really “up” or lively	1	2	3	4	5
40.	Had pain in my chest	1	2	3	4	5
41.	Felt really bored	1	2	3	4	5
42.	Felt like I was choking	1	2	3	4	5
43.	Looked forward to things with enjoyment	1	2	3	4	5
44.	Muscles twitched or trembled	1	2	3	4	5
45.	Felt pessimistic about the future	1	2	3	4	5
46.	Had a very dry mouth	1	2	3	4	5
47.	Felt like I had a lot of interesting things to do	1	2	3	4	5
48.	Was afraid I was going to die	1	2	3	4	5
49.	Felt like I had accomplished a lot	1	2	3	4	5
50.	Felt like it took extra effort to get started	1	2	3	4	5
51.	Felt like nothing was very enjoyable	1	2	3	4	5
52.	Heart was racing and pounding	1	2	3	4	5
53.	Felt like I had a lot to look forward to	1	2	3	4	5
54.	Felt numbness or tingling in my body	1	2	3	4	5
55.	Felt tense or “high-strung”	1	2	3	4	5
56.	Felt hopeful about the future	1	2	3	4	5
57.	Felt like there wasn’t anything interesting or fun to do	1	2	3	4	5
58.	Seemed to move quickly and easily	1	2	3	4	5
59.	Muscles were tense or sore	1	2	3	4	5
60.	Felt really good about myself	1	2	3	4	5
61.	Thought about death or suicide	1	2	3	4	5
62.	Had to urinate frequently	1	2	3	4	5

Appendix A.10 Barratt Impulsiveness Scale (BIS-11, Patton et al., 1995)

DIRECTIONS: People differ in the way they act and think in different situations. For each statement below circle one of the numbers to the right to indicate how the statement applies to you. Do not spend too much time on any statement. Answer quickly and honestly.

	Rarely / Never	**Occasionally**	**Often**	**Usually**
1. I plan tasks carefully	**1**	**2**	**3**	**4**
2. I "squirm" at plays or lectures	**1**	**2**	**3**	**4**
3. I act "on impulse"	**1**	**2**	**3**	**4**
4. I like to think about complex problems	**1**	**2**	**3**	**4**
5. I change residences	**1**	**2**	**3**	**4**
6. I often have extraneous (irrelevant) thoughts when thinking	**1**	**2**	**3**	**4**
7. I am restless at the theatre or lectures	**1**	**2**	**3**	**4**
8. I act on the spur of the moment	**1**	**2**	**3**	**4**
9. I am a careful thinker	**1**	**2**	**3**	**4**
10. I like puzzles	**1**	**2**	**3**	**4**
11. I change jobs.	**1**	**2**	**3**	**4**
12. I have "racing" thoughts	**1**	**2**	**3**	**4**
13. I don't "pay attention"	**1**	**2**	**3**	**4**
14. I buy things on impulse	**1**	**2**	**3**	**4**
15. I am self-controlled	**1**	**2**	**3**	**4**
16. I save regularly	**1**	**2**	**3**	**4**
17. I am future orientated	**1**	**2**	**3**	**4**
18. I change hobbies	**1**	**2**	**3**	**4**
19. I concentrate easily	**1**	**2**	**3**	**4**
20. I make-up my mind quickly	**1**	**2**	**3**	**4**
21. I say things without thinking	**1**	**2**	**3**	**4**
22. I am more interested in the present than the future	**1**	**2**	**3**	**4**
23. I can only think about one problem at a time	**1**	**2**	**3**	**4**
24. I am a steady thinker	**1**	**2**	**3**	**4**

	Rarely / Never	Occasionally	Often	Usually
25. I do things without thinking	**1**	**2**	**3**	**4**
26. I plan trips well ahead of time	**1**	**2**	**3**	**4**
27. I get easily bored when solving thought problems	**1**	**2**	**3**	**4**
28. I plan for job security	**1**	**2**	**3**	**4**
29. I spend or charge more than I earn	**1**	**2**	**3**	**4**
30. I am happy-go-lucky	**1**	**2**	**3**	**4**

Appendix A.11 Stroop Colour and Word Task (Golden & Freshwater, 1998)

The test consists of three pages. Each page has 100 items, presented in 5 columns of 20 items.
The Word page consists of the words "RED", "GREEN", and "BLUE" arranged randomly and printed in black ink on what white sheet of paper. Not word is allowed to follow itself within a column.
The Colour page consists of 100 items, all written as XXXX, printed in either red, green or blue ink. No colour was allowed to follow itself in a column nor to match the corresponding item on the word page.
The Colour-Word page consists of the words from the word page printed in the colours from the Colour page. The two pages are blended item for item. *In no case does the word and the colour it is printed in match one another.*

Administration
The subject is given a booklet containing all three pages, but views only one page at a time. The booklet is placed directly in front of the subject on a flat surface.

Instruction for the Word Page
After the subject has been given the test booklet, the following instructions are read:

> "This is a test of how fast you can read the words on this page. After I say begin, you are to read down the columns starting with the first one, until you complete it, and then continue without stopping down the remaining columns in order. If you finish all the columns before I say 'Stop', then return to the first column and begin again. Remember, do not stop reading until I tell you to stop, and read out loud as quickly as you can. If you make a mistake, I will say 'No' to you. Correct your error and continue without stopping. Are there any questions?"……..''Ready?...Then begin."

After 45 seconds say:

> "Stop. Circle the item you are on. If you finished the entire page and began again, put a one by your circle. Turn to the next page."

Instruction for the Colour Page
The instructions fro the Colour page are identical, except the first sentence reads:

> "This is a test on how fast you can name the colours on this page."

If the subject generally understands the instructions for the Word page, the remaining instructions can be given briefly.

> "You will complete this page as you did the previous page, starting with this first column. Remember to name the colours out loud as quickly as you can."

If the subject has any trouble following the instructions, they should be repeated in their entirety. As with the first page, the subject should be allowed 45 seconds.

Instructions for the Colour-Word Page
At the beginning of the Colour-Word page, the following instructions should be used:

> "The Word page is like the page you just finished. I want you to name the colour of the ink the words are printed in, ignoring

the word that is printed for each item. For example: this is the first item: what would you say?

If the subject is correct, go on with the instructions. If incorrect, say:

"No. That is the word that is spelled there. I want you to name the colour of the ink the word is printed in. Now, what would you say to this item?

If correct, proceed; if incorrect, repeat above as many times as necessary until the subject understands or it becomes clear that it is impossible to go on. Continue with the statement:

"Good. You will do this page just like the others, starting with the first column, and then going on to as many columns as you can. Remember, if you make a mistake, just correct it, and go on. Are there any questions? …Then begin"

After 45 seconds say:

"Stop. Circle the item you are on."

Finish.

Word Page

RED	BLUE	GREEN	RED	BLUE
GREEN	GREEN	RED	BLUE	GREEN
BLUE	RED	BLUE	GREEN	RED
GREEN	BLUE	RED	RED	BLUE
RED	RED	GREEN	BLUE	GREEN
BLUE	GREEN	BLUE	GREEN	RED
RED	BLUE	GREEN	BLUE	GREEN
BLUE	GREEN	RED	GREEN	RED
GREEN	RED	BLUE	RED	BLUE
BLUE	GREEN	GREEN	BLUE	GREEN
GREEN	RED	BLUE	RED	RED
RED	BLUE	RED	GREEN	BLUE
GREEN	RED	BLUE	RED	GREEN
BLUE	BLUE	RED	GREEN	RED
RED	GREEN	GREEN	BLUE	BLUE
BLUE	BLUE	RED	GREEN	RED
RED	GREEN	BLUE	RED	GREEN
GREEN	RED	GREEN	BLUE	BLUE
RED	BLUE	RED	GREEN	RED
GREEN	RED	GREEN	BLUE	GREEN

Colour Page

XXXX XXXX XXXX XXXX XXXX

XXXX XXXX XXXX XXXX XXXX

XXXX XXXX XXXX XXXX XXXX

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XXXX XXXX XXXX XXXX XXXX

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XXXX XXXX XXXX XXXX XXXX

Colour-Word Page

RED	BLUE	GREEN	RED	BLUE
GREEN	GREEN	RED	BLUE	GREEN
BLUE	RED	BLUE	GREEN	RED
GREEN	BLUE	RED	RED	BLUE
RED	RED	GREEN	BLUE	GREEN
BLUE	GREEN	BLUE	GREEN	RED
RED	BLUE	GREEN	BLUE	GREEN
BLUE	GREEN	RED	GREEN	RED
GREEN	RED	BLUE	RED	BLUE
BLUE	GREEN	GREEN	BLUE	GREEN
GREEN	RED	BLUE	RED	RED
RED	BLUE	RED	GREEN	BLUE
GREEN	RED	BLUE	RED	GREEN
BLUE	BLUE	RED	GREEN	RED
RED	GREEN	GREEN	BLUE	BLUE
BLUE	BLUE	RED	GREEN	RED
RED	GREEN	BLUE	RED	GREEN
GREEN	RED	GREEN	BLUE	BLUE
RED	BLUE	RED	GREEN	RED
GREEN	RED	GREEN	BLUE	GREEN

Appendix A.12 Digit Span Subtest (DS, Wechsler, 1997)

General Directions
The two parts of digit span – Forwards and Backwards – are administered separately. *Administer both trials of each item even if the examinee passes Trial 1.* Read the digits at the rate of one per second, dropping your voice inflection slightly on the last digit of the sequence. Pause to allow the examinee to respond.

Digits Forwards
Start: Trial 1 of Item 1.
Discontinue: Discontinue after a score of 0 on *both* trials of any item.
Item Instructions: Before administering Trial 1 of Item 1 say:

> **I am going to say some numbers. Listen carefully, and when I am through, I want you to say them right back to me. Just say what I say.**

Trial		Item	Response	Trial Score	Item Score (0, 1 or 2)
1.	1.	1-7			
	2.	6-3			
2.	1.	5-8-2			
	2.	6-9-4			
3.	1.	6-4-3-9			
	2.	7-2-8-6			
4.	1.	4-2-7-3-1			
	2.	7-5-8-3-6			
5.	1.	6-1-9-4-7-3			
	2.	3-9-2-4-8-7			
6.	1.	5-9-1-7-4-2-8			
	2.	4-1-7-9-3-8-6			
7.	1.	5-8-1-9-2-6-4-7			
	2.	3-8-2-9-5-1-7-4			
8.	1.	2-7-5-8-6-2-5-8-4			
	2.	7-1-3-9-4-2-5-6-8			
				Total	

Digits Backwards

Start: Trial 1 of Item 1.

Discontinue: Discontinue after a score of 0 on *both* trials of any item.

Item Instructions: Before administering Trial 1 of Item 1 say:

> **Now I am going to say some more numbers. But this time when I stop, I want you to say them backward. For example, if I say 7-1-9, what would you say?**

If the examinee responds correctly (9-1-7) say:

> **That's right.**

Proceed to Trial 1 on Item 1. However, if the examinee responds incorrectly, provide the correct response and say:

> **No, you would say 9-1-7, I said 7-1-9, so to say it backward, you would say 9-1-7. Now try these numbers. Remember, you are to them backwards: 3-4-8.**

Do not provide any assistance in this example, or any of the items. Whether or not the examinee responds correctly (i.e. 8-4-3), proceed to Trial 1 of Item 1.

Trial		**Item**	**Response**	**Trial Score**	**Item Score** (0, 1 or 2)
1.	**1.**	**2-4**			
	2.	**5-7**			
2.	**1.**	**6-2-9**			
	2.	**4-1-5**			
3.	**1.**	**3-2-7-9**			
	2.	**4-9-6-8**			
4.	**1.**	**1-5-2-8-6**			
	2.	**6-1-8-4-3**			
5.	**1.**	**5-3-9-4-1-8**			
	2.	**7-2-4-8-5-6**			
6.	**1.**	**8-1-2-9-3-6-5**			
	2.	**4-7-3-9-1-2-8**			
7.	**1.**	**9-4-3-7-6-2-5-8**			
	2.	**7-2-8-1-9-6-5-3**			
				Total	

Appendix A.13 Wechsler Test of Adult Reading (WTAR, The Psychological Corporation, 2001)

Below is a list of words that I am going to ask you to pronounce for me. Beginning with the first word on the list, pronounce each word aloud. Start with Item 1, and go down the left column, without skipping any words. When this column is finished, go to the next column. Pronounce each word, even if you are unsure.

	Item
1.	again
2.	address
3.	cough
4.	preview
5.	although
6.	most
7.	excitement
8.	know
9.	plumb
10.	decorate
11.	fierce
12.	knead
13.	aisle
14.	vengeance
15.	prestigious
16.	wreathe
17.	gnat
18.	amphitheatre
19.	lieu
20.	grotesque
21.	iridescent
22.	ballet
23.	equestrian
24.	porpoise
25.	aesthetic

	Item
26.	conscientious
27.	homily
28.	malady
29.	subtle
30.	fecund
31.	palatable
32.	menagerie
33.	obfuscate
34.	liaison
35.	exigency
36.	xenophobia
37.	ogre
38.	scurrilous
39.	ethereal
40.	paradigm
41.	perspicuity
42.	plethora
43.	lugubrious
44.	treatise
45.	dilettante
46.	vertiginous
47.	ubiquitous
48.	hyperbole
49.	insouciant
50.	hegemony

Appendix A.14 Young Mania Rating Scale (YMRS, Young et al., 1978)

I. ELEVATED MOOD

0 Absent
1 Mildly or possibly increased on questioning
2 Definite subjective elevation; optimistic, self-confident, cheerful, appropriate to content
3 Elevated, inappropriate to content, humorous
4 Euphoric, inappropriate laughter, singing

II. INCREASED MOTOR ACTIVITY-ENERGY

0 Absent
1 Subjectively increased
2 Animated, gestures increase
3 Excessive energy, hyperactive at times, restless (can be calmed)
4 Motor excitement; continuous hyperactivity (cannot be calmed)

III. SEXUAL INTEREST

0 Normal; not increased
1 Mildly or possibly increased
2 Definite subjective increase on questioning
3 Spontaneous sexual content; elaborates on sexual matters; hypersexual by self-report
4 Overt sexual acts (towards patients, staff or interviewer)

IV. SLEEP

0 Reports no decrease in sleep
1 Sleeping less than normal amount by up to one hour
2 Sleeping less than normal by more than one hour
3 Reported decreased need for sleep
4 Denies need for sleep

V. IRRITABILITY

0 Absent
1
2 Subjectively increased
3
4 Irritable at time during interview; recent episodes of anger or annoyance on ward
5
6 Frequently irritable during interview; short curt throughout
7
8 Hostile, uncooperative; interview impossible

VI. SPEECH (rate and amount)

0 No increase
1
2 Feels talkative
3
4 Increased rate or amount at times, verbose at times
5
6 Push; consistently increased rate and amount; difficult to interrupt
7
8 Pressured; uninterruptible, continuous speech

VII. LANGUAGE_THOUGHT DISORDER

0 Absent
1 Circumstantial; mild distractibility; quick thoughts
2 Distractible; loses goal of though; changes topic frequently; racing thoughts
3 Flight of ideas; tangentiality; difficult to follow; rhyming, echolalia
4 Incoherent, communication impossible

VIII. CONTENT

0 Normal
1
2 Questionable plans, new interests
3
4 Special projects(s); hyperreligous
5
6 Grandiose or paranoid ideas, ideas of reference
7
8 Delusions; hallucinations

IX. DISRUPTIVE-AGGRESSIVE BEHAVIOUR

0 Absent, cooperative
1
2 Sarcastic; loud at times, guarded
3
4 Demanding; threats on ward
5
6 Threatens interviewer; shouting; interview difficult
7
8 Assault; destructive; interview impossible

X. APPEARANCE

0 Appropriate dress and grooming
1 Minimally unkempt
2 Poorly groomed, moderately dishevelled; overdressed
3 Dishevelled; partly clothed; garish make-up
4 Completely unkempt, decorated, bizarre garb

XI. INSIGHT

0 Present; admits illness; agrees with need for treatment
1 Possibly ill
2 Admits behaviour change, but denies illness
3 Admits possible change in behaviour, but denies illness
4 Denies any behaviour change

Appendix B Approvals from Research and Ethics Committee

Appendix B.1 Study One Approval

PO Royal Melbourne Hospital
Parkville Victoria 3050
Telephone 61 3 9342 8530
Facsimile 61 3 9342 8548
Email: research.directorate@mh.org.au
Website: www.mh.org.au/research
ABN 73 802 706 972

RESEARCH DIRECTORATE

MELBOURNE HEALTH

13th December 2004

Dr Leanne Hides
ORYGEN
Locked Bag 10
PARKVILLE 3050

Dear Leanne,

RE: MHREC 2004.052 Trauma and substance abuse in young people: exploring situation specific drug use

Thank you for your letter responding to the comments raised by the Committee.

Your protocol was reviewed and approved by the Mental Health Research and Ethics Committee on the **1.12.04**.

Enclosed please find a copy of the signed approval certificate.

This completes the requirements for the Ethics and Research approval.

On behalf of the Committee may I wish you the very best in your research and we look forward to hearing your results.

Yours Sincerely,

DR. STACEY GABRIEL
Secretary
Mental Health Research and Ethics Committee

The Human Research Ethics Committee operates in accordance with the *NHMRC National Statement of Ethical Conduct in Research Involving Humans, 1999*

Charles Connibere Building
The Royal Melbourne Hospital
Flemington Road
Parkville Victoria 3052
Telephone 61 3 9342 8155
Facsimile 61 3 9342 8813
[redacted]
ABN 73 802 706 972

Research Directorate – Mental Health Research and Ethics Committee Approval Form

Telephone: 9342 7098 Facsimile: 9342 8548

MELBOURNE HEALTH

This is to certify that

MHREC Project No: 2004.052 **Approval date: 1.12.04** **Expiry date: 1.12.07**

Project Title: Trauma and substance abuse in young people: exploring situation specific drug use

Sponsored by:

Principal Investigator: Dr Leanne Hides

Protocol No:

Anticipated commencement of Study: 01.10.04

Participant Information and Consent Form: Version 2 25 October 2004

Investigator Brochure:

Other enclosures:(please describe eg advertisement etc.)

Conducted at: ORYGEN has been approved

It is now your responsibility to ensure that all people conducting this research project are made aware of which documents have been approved.

This approval is subject to ongoing, current and valid insurance coverage throughout the duration of the conduct of the study.

You are required to notify the Secretary of the Human Research Ethics Committee of

- Any change in the protocol and the reason for that change together with an indication of ethical implications (if any) by submitting an amendment to the study.
- Serious adverse effects on subjects and the action taken to manage them, including amended Plain Language Statement and Consent Form where appropriate.
- Any unforseen events.
- Your inability to continue as Principal Investigator, or any other change in research personnel involved in the study
- A delay of more than 12 months in the commencement of the project.
- The actual date of commencement of the study.

You are required to submit to the Human Research Ethics Committee

- An Annual Report every twelve months for the duration of the project.
- A detailed Final Report at the conclusion of the project.

The Human Research Ethics Committee may conduct an audit at any time.

An extension of the project beyond the stated conclusion date should be sought from the Human Research Ethics Committee.

Signed:

DR STACEY GABRIEL
Secretary
Mental Health Research and Ethics Committee

Appendix B.2 Study Two Approval

PO Royal Melbourne Hospital
Parkville Victoria 3050
Telephone 61 3 9342 8530
Facsimile 61 3 9342 8548
Email: research.directorate@mh.org.au
Website: www.mh.org.au/research
ABN 73 802 706 972

MELBOURNE HEALTH

RESEARCH DIRECTORATE

24th August 2005

Dr Leanne Hides
ORYGEN
Locked Bag 10
PARKVILLE 3052

Dear Leanne,

RE: MHREC 2005.038 The convergent validity of self report and neuropsychological measures of impulsivity in young substance users

Your protocol was reviewed and approved by the Mental Health Research and Ethics Committee on the **03.08.05**.

Enclosed please find a copy of the signed approval certificate.

On behalf of the Committee may I wish you the very best in your research and we look forward to hearing your results.

Yours Sincerely,

Dr. Stacey Gabriel
Secretary
Mental Health Research and Ethics Committee

The Human Research Ethics Committee operates in accordance with the *NHMRC National Statement of Ethical Conduct in Research Involving Humans, 1999*

Charles Connibere Building
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Website www.mh.org.au

MELBOURNE HEALTH

Research Directorate – Mental Health Research and Ethics Committee Approval Form

Telephone: 9342 7098 Facsimile: 9342 8548

This is to certify that

MHREC Project No: 2005.038 **Approval date: 03.08.05** **Expiry date: 03.08.08**

Project Title: The convergent validity of self report and neuropsychological measures of impulsivity in young substance users

Sponsored by: N/A

Principal Investigator: Dr Leanne Hides

Protocol No: N/A

Anticipated commencement of Study: 10/08/05

Participant Information and Consent Form: July 2005

Investigator Brochure: N/A

Other enclosures: N/A

Conducted at: Drug and Alcohol Service (DAS) West has been approved

It is now your responsibility to ensure that all people conducting this research project are made aware of which documents have been approved.

This approval is subject to ongoing, current and valid insurance coverage throughout the duration of the conduct of the study.

You are required to notify the Secretary of the Human Research Ethics Committee of

- Any change in the protocol and the reason for that change together with an indication of ethical implications (if any) by submitting an amendment to the study.
- Serious adverse effects on subjects and the action taken to manage them, including amended Plain Language Statement and Consent Form where appropriate.
- Any unforseen events.
- Your inability to continue as Principal Investigator, or any other change in research personnel involved in the study
- A delay of more than 12 months in the commencement of the project.
- The actual date of commencement of the study.

You are required to submit to the Human Research Ethics Committee

- An Annual Report every twelve months for the duration of the project.
- A detailed Final Report at the conclusion of the project.

The Human Research Ethics Committee may conduct an audit at any time.

An extension of the project beyond the stated conclusion date should be sought from the Human Research Ethics Committee.

Signed:

Dr Stacey Gabriel
Secretary
Mental Health Research and Ethics Committee

Appendix C.1 Consent Forms and Participant Information for Study One

AER Foundation Ltd	**Participant Information Form** **Participant version - December 2004**	THE UNIVERSITY OF MELBOURNE ORYGEN Youth Health

Project title: Substance abuse and trauma in young people: Exploring situation specific drug use.

Principal Researcher: Fritha Melville
Associate Researchers: Dr Leanne Hides Dr Petra Staiger; Dr Dan Lubman; & Erin Cowley

_____

Protocol No: _____

This Participant Information and Consent Form is 4 pages long. Please make sure you have all the pages.

1. Your Consent

This Participant Information contains detailed information about the research project. Its purpose is to explain to you as openly and clearly as possible all the procedures involved in this project before you decide whether or not to take part in it.

Please read this Participant Information carefully. Feel free to ask questions about any information in the document. You may also wish to discuss the project with a relative or friend or your local health worker. Feel free to do this.

Once you understand what the project is about and if you agree to take part in it, you will be asked to sign the Consent Form. By signing the Consent Form, you indicate that you understand the information and that you give your consent to participate in the research project.

You will be given a copy of the Participant Information and Consent Form to keep as a record.

2. Purpose and background.

High rates of co-occurring trauma and substance use disorders have been documented amongst adult and youth populations. Adults who have a substance use problems and a history of trauma are more likely to use drugs in order to reduce to negative emotions, particularly in negative situations, such as, feeling anxious or sad or when having an argument with someone. This is in contrast to the majority of people with substance use problems who report using drugs to increase positive emotions, such as, increasing your confidence. Little is known about how trauma and the regulation of mood influences substance misuse behaviours.

Issues such as a history of trauma are important when considering the best treatment for a person. The possibility that negative situations are high risk situations for relapse in young people with a history of trauma and substance misuse has not yet been explored in young people. As such this project will help us design more effective drug and alcohol treatment services for young people with a history of trauma.

A total 100 young people will participate in this project.

The results of this research may be used to help Fritha Melville, a student at Deakin University to obtain her post graduate psychology degree.

3. Procedures

Participation in this project will involve:

- Completing a number of questionnaires relating to your personal circumstances, drug use and psychological health
- All you will need to do is tick or circle the response that is most likely to be you. There are no right or wrong answers to any of these questions. Below are some examples of the questions you will have to answer:

    - In the past 4 weeks what drugs have you used?
    - Do you take drugs to relieve boredom, to forget about your problems etc?
    - Sometimes things happened to people that are extremely upsetting. Have you ever experienced a life threatening accident, been beaten up etc?
    - If something bad has happened do you think about the event often?

- It will take approximately 2 hours of your time.
- Before the interview you will need to read this letter of information and sign the consent form.

4. Possible benefits

We cannot promise that you will benefit directly from your participation in this project. The information you provide will be used to gain a greater understanding of what situations young people are more likely to use drugs in and how treatment services can address these issues.

5. Possible risks

You may feel some distress when filling out some of the questions especially those that ask you whether you have experienced any traumatic events in your life. Remember you may stop at any time if you find it too upsetting.

If you do begin to feel upset we will:

- Stop or postpone the interview until later
- You can discuss your issues and distress with the interviewer or any of the other researchers (all of whom are trained health workers) and can discuss a care plan.
- You will be encouraged to contact your case manager or another support person either immediately or later.
- Alternatively, you can also contact:

- Kids Helpline 1800 551 800 (www.kidshelp.com.au);
- SANE Helpline 1800 688 382 (www.itsallright.org);
- Lifeline 13 11 14.

Every effort will be made to ensure your safety and that the research interview has had no adverse impact on you.

6. Privacy, Confidentiality and Disclosure of Information

We will attempt to maintain the privacy and confidentiality of your responses and any information that you give to this project. If you mention illegal activities (drug use), confidentiality will be maintained at all times except where the interviewer is ethically bound to break this confidentiality.

Exception to confidentiality include: (a) if you disclose that you are at risk of harming yourself; (b) if you disclose that you are at risk of harming others; (c) if there is a court order for the information; and (d) if you are under18 years and disclose that you are at risk of being abused.

If you are aged under 18 years of age and disclose that you have been or are at risk of being abused, for example if you are being physically or sexually hurt by someone else, the interviewer (a registered psychologist) is legally obliged to report this to Child Protection Services. In order to ensure that you have the best support possible throughout this process the interviewer will inform your case manager and both will take steps to ensure your safety and wellbeing.

If you are over 18 years of age and disclose that you are currently being abused, you will be encourage to seek help. The interviewer can give you some contacts.

Your name will not be recorded anywhere in relation to your responses. Analysis of the data will be based on all participants. In any publication, information will be provided in such a way that you cannot be identified.

The records will be kept securely for 7 years at the research centre after which time they will be shredded. They will be kept in a locked file cabinet that can only be accessed by the research team.

7. Results of the project

A copy of the report with the results of the project will be give to ORYGEN Youth and other community agencies. You are free to look at this or request a copy. If you would like a copy please contact one of the researchers and we can make sure you get one.

The research may also be published but the results will only be reported as group data and individuals will not be identified.

8. Further information or any problems

If you require further information or if you have any problems concerning this project you can contact ORYGEN switch, 9342 2800 and they will forward your call to one of the researchers responsible for this project (they can call you back or arrange a meeting time).

9. Other Issues
If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact either:

- ORYGEN 9342 2800, and they will forward your call to Professor Bruce Singh OR
- Deakin University 9251 7123, and you can speak to the Secretary of Ethics Dr Victoria Emery

If you are concerned about your substance use the interviewer can provide you with some more information and contacts and / or you can telephone Directline (Telephone: 1800 888 236) a free telephone line providing advice and counselling on drug and alcohol issues.

10. Participation is voluntary
Participation in any research project is voluntary. You do not have to take part in the project. If you decide to take part and later change your mind, you are free to withdraw from the project at any time without comment. Your decision to take part or not to take part, or to take part and then withdraw, will not affect your relationship with your health worker or organisation.

Before you make your decision, a member of the research team will be available to answer any questions you have about the research project. You can ask for any information you want. Sign the Consent Form only after you have asked your questions and have received satisfactory answers.

11. Ethical guidelines

This project will be carried out according to the *National Statement on Ethical Conduct in Research Involving Humans* (June 1999) produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies. The ethical aspects of this research project have been approved by the Human Research Ethics Committee and Deakin University Research and Ethics Committee.

12. Reimbursement for your time and costs
You will be entitled to $20 cash. This voucher is in acknowledgment of your time and cost required in participating in this research.

The researchers would like to thank the **Alcohol Education & Rehabilitation Foundation (AERF)** for their generous financial contribution towards this project.

	Participant Information Form **Participant version - December 2004**	

Project title: Substance abuse and trauma in young people: Exploring situation specific drug use.

Principal Researcher: Fritha Melville
Associate Researchers: Dr Leanne Hides Dr Petra Staiger; Dr Dan Lubman; & Erin Cowley

Protocol No: _____

I have read, or have had read to me and I understand the Participant Information

I freely agree to participate in this project according to the conditions in the Participant Information.

I will be given a copy of the Participant Information and Consent Form to keep

The researcher has agreed not to reveal my identity and personal details if information about this project is published or presented in any public form.

Participant's name (printed) _____

Signature _____ Date _____

Name of Witness (printed) _____

Signature _____ Date_____

Researcher's Name (printed) _____

Signature _____ Date _____

Note: All parties signing the Consent Form must date their own signature.

AER Foundation Ltd	**Participant Information Form** **Participant version – July 2005**	THE UNIVERSITY OF MELBOURNE ORYGEN Youth Health

Project title: The Convergent Validity of Self Report and Neuropsychological Measures of Impulsivity in Young Substance Users

Principal Researcher: Dr Leanne Hides
Associate Researchers: Dr Carol Hulbert, Dr Murat Yucel, Sue Cotton & Erin Cowley

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Protocol No: _____

This Participant Information and Consent Form is 4 pages long. Please make sure you have all the pages.

1. Your Consent

This Participant Information contains detailed information about the research project. Its purpose is to explain to you as openly and clearly as possible all the procedures involved in this project before you decide whether or not to take part in it.
Please read this Participant Information carefully. Feel free to ask questions about any information in the document. You may also wish to discuss the project with a relative or friend or your local health worker. Feel free to do this.

Once you understand what the project is about and if you agree to take part in it, you will be asked to sign the Consent Form. By signing the Consent Form, you indicate that you understand the information and that you give your consent to participate in the research project.

You will be given a copy of the Participant Information and Consent Form to keep as a record.

2. Purpose and background.

There is growing evidence that impulsivity (responding to things quickly) is an important risk factor for alcohol and substance misuse. Despite this we have very little understanding of how to properly define or measure it. This study aims to examine measures of two components of impulsivity, rash impulsivity and reward sensitivity, and compare the results of self report and neuropsychological tests of impulsivity to determine if they are measuring the same thing.

A total 40 young people will participate in this project.

We would also like you permission to use your results from the study called *Trauma and substance abuse in young people: Exploring situation specific drug use* that you just participated in. This will provide us with valuable information for the current study and save you from completing the same measures twice.

The results of this research may be used to help Erin Cowley, a student at the University of Melbourne to obtain her post graduate psychology degree.

3. Procedures

Participation in this project will involve:

- Completing a number of questionnaires relating to your personality.
- All you will need to do is tick or circle the response that is most likely to be you. There are no right or wrong answers to any of these questions. Below are some examples of the questions you will have to answer:
    - I plan tasks carefully
    - I act on the spur of the moment
    - Do you often refrain from doing something because you are afraid of it being illegal?
    - Does the good prospect of obtaining money motivate you strongly to do some things?
- Complete a laptop task that requires you to make left/right responses as quickly and as accurately as possible (via button press).
- Complete a number of pencil and paper tasks and questionnaires that are designed to assess your attention.
- It will take approximately 45 minutes of your time.
- Finally, we would like your permission to contact you to see if you are interested in participating in future research. Of course, participation in future projects will be completely voluntary.

4. Privacy, Confidentiality and Disclosure of Information

We will attempt to maintain the privacy and confidentiality of your responses and any information that you give to this project. If you mention illegal activities (drug use), confidentiality will be maintained at all times except where the interviewer is ethically bound to break this confidentiality.

Exception to confidentiality include: (a) if you disclose that you are at risk of harming yourself; (b) if you disclose that you are at risk of harming others; and (c) if there is a court order for the information.

Your name will not be recorded anywhere in relation to your responses. Analysis of the data will be based on all participants. In any publication, information will be provided in such a way that you cannot be identified.

The records will be kept securely for 7 years at the research centre after which time they will be shredded. They will be kept in a locked file cabinet that can only be accessed by the research team.

5. Possible benefits

We cannot promise that you will benefit directly from your participation in this project. The information you provide will be used to gain a greater understanding of

the impulsivity traits in young people who are more likely to use drugs, and how treatment services can address these issues.

6. Possible risks

There are no physical or social risks associated with participating in this project. The legal risks of reporting illegal activities (i.e. drug use) are minimised by maintaining confidentiality at all times, except where ethically bound to break the confidentiality agreement (described above). You will not be asked about other illegal activities apart from illicit drug use.

As part of your participation in this project you may experience some distress when filling out questionnaires. However, most participants experience these interviews as a positive experience. In case of distress, the interviews can be stopped, postponed or finished at another time. One of the researchers will be available to provide counselling if you should require it, or you can contact your case manager or another support person either immediately or later.
Alternatively, you can also contact:

- Kids Helpline 1800 551 800 (www.kidshelp.com.au);
- SANE Helpline 1800 688 382 (www.itsallright.org);
- Lifeline 13 11 14.
- Directline 1800 888 326
- YSASline 9418 1020

Every effort will be made to ensure your safety and that the research interview has had no adverse impact on you.

7. Results of the project

A copy of the report with the results of the project will be given to Drug and Alcohol Services West (DASWest). You are free to look at this or request a copy. If you would like a copy please contact one of the researchers and we can make sure you get one.
The research may also be published but the results will only be reported as group data and individuals will not be identified.

8. Further information or any problems

If you require further information or if you have any problems concerning this project you can contact ORYGEN switch, 9342 2800 and they will forward your call to one of the researchers responsible for this project (they can call you back or arrange a meeting time).

9. Other Issues

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact :

- ORYGEN 9342 2800, and they will forward your call to Professor Bruce Singh OR
- Dr. Stacey Gabriel, Secretary, Mental Health Research and Ethics Committee on 9342 7098. (N.B. You will need to tell Dr. Gabriel the name of one of the researchers named above).

If you are concerned about your substance use the interviewer can provide you with some more information and contacts and / or you can telephone Directline (Telephone: 1800 888 236) a free telephone line providing advice and counselling on drug and alcohol issues.

10. Participation is voluntary

Participation in any research project is voluntary. You do not have to take part in the project. If you decide to take part and later change your mind, you are free to withdraw from the project at any time without comment. Your decision to take part or not to take part, or to take part and then withdraw, will not affect your relationship with your health worker or organisation.

Before you make your decision, a member of the research team will be available to answer any questions you have about the research project. You can ask for any information you want. Sign the Consent Form only after you have asked your questions and have received satisfactory answers.

11. Ethical guidelines

This project will be carried out according to the *National Statement on Ethical Conduct in Research Involving Humans* (June 1999) produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies. The ethical aspects of this research project have been approved by the Human Research Ethics Committee and Deakin University Research and Ethics Committee.

12. Reimbursement for your time and costs

You will be entitled to $10. This voucher is in acknowledgment of your time and cost required in participating in this research.

The researchers would like to thank the **Alcohol Education & Rehabilitation Foundation (AERF)** for their generous financial contribution towards this project.

	Participant Information Form **Participant version – July 2005**	

Project title: The Convergent Validity of Self Report and Neuropsychological Measures of Impulsivity in Young Substance Users

Principal Researcher: Dr Leanne Hides
Associate Researchers: Dr Carol Hulbert, Dr Murat Yucel, Sue Cotton & Erin Cowley

Protocol No: _____

I have read, or have had read to me and I understand the Participant Information.

I freely agree to participate in this project according to the conditions in the Participant Information.

I will be given a copy of the Participant Information and Consent Form to keep

The researcher has agreed not to reveal my identity and personal details if information about this project is published or presented in any public form.

I give permission to access data from previous studies for use in the current study. Yes / No

I give permission to contact me for potential future projects Yes / No

Participant's name (printed) _____

Signature _____ Date _____

Name of Witness (printed) _____

Signature _____ Date_____

Researcher's Name (printed) _____

Signature _____ Date _____

Note: All parties signing the Consent Form must date their own signature.

Appendix D Results from Analyses Using Non-transformed Variables

Appendix D.1 Tables of results from correlational analyses and hierarchical multiple regressions conducted in study one using non-transformed variables

Table 1:

Correlational Matrix for Personality, Coping, Motives and Affect using the non-transformed Enhancement Motives and Coping Motives Variables

Variable[1]	BAS	BIS	Cop_Task	Cop_Emo	Cop_Avo	Mot_Enh	Mot_Cop	Mot_Soc	PA	NA	Anx	Dep
BAS	1.00	.44**	.11	.43**	.08	.20*	.23*	.29**	.12	.28**	.25*	.20**
BIS		1.00	-.14	.44**	-.04	.03	.22*	.20*	-.06	.37**	.30**	.32**
Cop_Task			1.00	.06	.59**	.00	.00	.05	.45**	.00	.04	-.12
Cop_Emo				1.00	.24**	.33**	.55**	.37**	.07	.68**	.62**	.66**
Cop_Avo					1.00	.14	.11	.21*	.46**	.08	.21*	-.04
Mot_Enh						1.00	.65**	.63**	.16	.18*	.24**	.25**
Mot_Cop							1.00	.60**	.12	.35**	.43**	.41**
Mot_Soc								1.00	.18*	.20*	.39**	.25**
PA									1.00	.07	.10	-.12
NA										1.00	.76**	.74**
Anx											1.00	.76**
Dep												1.00

Notes. [1] BAS=Sensitivity to Reward, BIS=Sensitivity to Punishment, Cop_Task=task-oriented coping (CISS), Cop_Emo=emotion-oriented coping (CISS), Cop_Avo=avoidance coping (CISS), Mot_Enh=Enhancement Motives (DUMM), Mot_Cop=Coping motives (DUMM), Mot_Soc=Social Motives (DUMM), PA=positive affect (PANAS), NA=negative affect (PANAS), Anx=General Distress: Anxiety (MASQ), Dep=General Distress: Depression (MASQ).

* $p<.05$. ** $p<.01$

Table 2:

Correlational Matrix for Substance Use and Personality, Coping, Motives and Affect using the non-transformed Enhancement Motives, Coping Motives, Severity of Dependence Scale, Standard Drinking Units and Standard Cannabis Units Variables.

Variable[1]	Age_FDU	Cur_Dia	Life_Dia	SDS	DSDU	DSCU
BAS	-.14	.13	.13	.06	.22*	.08
BIS	-.07	-.07	.09	.15	.12	-.09
Cop_Task	.04	.02	-.02	.07	-.04	.11
Cop_Emo	-.22*	.03	.28**	.24**	.04	.24**
Cop_Avo	.12	.07	-.03	.14	.01	.27**
Mot_Enh	-.09	.16	.36**	.15	.12	.20*
Mot_Cop	-.11	.11	.26**	.23*	.19*	.20*
Mot_Soc	-.13	.14	.28**	.14	.38**	.31**
PA	-.01	.17	.01	.08	.23*	.10
NA	-.08	.10	.23*	.23*	.11	.23*
Anx	-.07	.15	.22*	.23*	.18	.31**
Dep	-.13	.01	.15	.15	-.03	.17
Gender	.06	-.11	-.02	.09	-.03	-.13

Notes. [1] Age_FDU=Age of first drug use (incl. cigarettes and alcohol), Cur_Dia=number of current substance use diagnoses as defined by SCID-IV, Life_Dia=number of lifetime substance use diagnoses as defined by SCID-IV, SDS=Substance dependence scale, DSDU=Number of standard drinking units per day in the past month, DSCU=Number of standard cannabis units per day in the past month, BAS=Sensitivity to Reward, BIS=Sensitivity to Punishment, Cop_Task=task-oriented coping (CISS), Cop_Emo=emotion-oriented coping (CISS), Cop_Avo=avoidance coping (CISS), Mot_Enh=Enhancement Motives (DUMM), Mot_Cop=Coping motives (DUMM), Mot_Soc=Social Motives (DUMM), PA=positive affect (PANAS), NA=negative affect (PANAS), Anx=General Distress: Anxiety (MASQ), Dep=General Distress: Depression (MASQ).

* $p<.05$. ** $p<.01$

Table 3:

Hierarchical Multiple Regressions Showing Predictors of Severity of Dependence and Lifetime Diagnoses using Non-transformed Enhancement Motives and Severity of Dependence Scale Variables

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
SDS					.	
Step 1:	Gender	.52	.54	.09	.01	.01
Step 2:	Gender	.29	.58	.05		
	BAS	-.05	.08	-.06		
	Cop_Emo	.05	.03	.22*		
	Mot_Enh	.05	.06	.08		
	PA	.02	.03	.07	.07	.06
Life_Dia						
Step 1:	Gender	-.07	.25	-.02	.00	.00
Step 2:	Gender	-.27	.26	-.10		
	BAS	.00	.04	.01		
	Cop_Emo	.02	.01	.22*		
	Mot_Enh	.09	.03	.30**		
	PA	-.01	.01	-.08	.17**	.17**

Notes. [1] Life_Dia=number of lifetime substance use diagnoses as defined by SCID-IV, SDS=Substance dependence scale, BAS=Sensitivity to Reward, Cop_Emo =emotion-oriented coping (CISS), Mot_Enh=Enhancement Motives (DUMM), PA=positive affect (PANAS).

* $p<.05$. ** $p<.01$

Table 4:

Hierarchical Multiple Regressions Showing Predictors of Severity of Substance Dependence and Lifetime SUD Diagnoses, using Non-transformed Coping Motives and Severity of Dependence Scale Variables

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
SDS					.	
Step 1:	Gender	.52	.54	.09	.01	.01
Step 2:	Gender	.22	.55	.04		
	BIS	.04	.07	.06		
	Cop_Avo	.03	.03	.12		
	Mot_Cop	.09	.06	.15		
	NA	.04	.03	.14	.09	.09*
Life_Dia						
Step 1:	Gender	-.07	.26	-.02	.00	.00
Step 2:	Gender	-.31	.26	-.11		
	BIS	.00	.03	-.01		
	Cop_Avo	-.01	.01	-.09		
	Mot_Cop	.06	.03	.23*		
	NA	.03	.02	.19	.11*	.11*

Notes. [1] Life_Dia=number of lifetime substance use diagnoses as defined by SCID-IV, SDS=Substance dependence scale, BIS=Sensitivity to Punishment, Cop_Avo=avoidance coping (CISS), Mot_Cop=Coping motives (DUMM), NA=negative affect (PANAS).

* $p<.05$. ** $p<.01$

Table 5:

Hierarchical Multiple Regressions Showing Predictors of Alcohol and Cannabis Use using Non-transformed Enhancement Motives, Standard Drinking Units and Standard Cannabis Units Variables

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
DSDU					.	
Step 1:	Gender	-.59	1.66	-.03	.00	.00
Step 2:	Gender	.12	1.74	.01		
	BAS	.53	.24	.22*		
	Cop_Emo	-.07	.08	-.10		
	Mot_Enh	.14	.18	.08		
	PA	.20	.09	.20	.10	.10*
DSCU						
Step 1:	Gender	-14.18	9.87	-.13	.02	.02
Step 2:	Gender	-21.70	10.39	-.20*		
	BAS	-.43	1.42	-.03		
	Cop_Emo	1.18	.46	.28*		
	Mot_Enh	1.26	1.09	.11		
	PA	.13	.56	.02	.12	.10*

Notes. [1] DSDU=Number of standard drinking units per day in the past month, DSCU=Number of standard cannabis units per day in the past month, BAS=Sensitivity to Reward, Cop_Emo=emotion-oriented coping (CISS), Mot_Enh=Enhancement Motives (DUMM), PA=positive affect (PANAS).
* $p<.05$. ** $p<.01$

Table 6:

Hierarchical Multiple Regressions Showing Predictors of Alcohol and Cannabis Use using Non-transformed Coping Motives, Standard Drinking Units and Standard Cannabis Units Variables

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
DSDU					.	
Step 1:	Gender	-.59	1.66	-.03	.00	.00
Step 2:	Gender	-1.59	1.74	-.09		
	BIS	.17	.22	.08		
	Cop_Avo	-.02	.08	-.02		
	Mot_Cop	.32	.19	.18		
	NA	.04	.10	.04	.05	.05
DSCU						
Step 1:	Gender	-14.18	9.92	-.13	.02	.02
Step 2:	Gender	-16.20	9.71	-.15		
	BIS	-2.32	1.24	-.18		
	Cop_Avo	1.05	.45	.21*		
	Mot_Cop	1.66	1.05	.15		
	NA	1.45	.55	.26**	.18	.17**

Notes. [1] DSDU=Number of standard drinking units per day in the past month, DSCU=Number of standard cannabis units per day in the past month, BIS=Sensitivity to Punishment, Cop_Avo=avoidance coping (CISS), Mot_Cop=Coping motives (DUMM), NA=negative affect (PANAS).

* $p<.05$** $p<.01$

Table 7:

Hierarchical Multiple Regressions Exploring Significant Predictors of SDS and Lifetime SUD Diagnoses using Non-transformed Enhancement Motives, Coping Motives and Severity of Dependence Scale Variables

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
SDS					.	
Step 1:	Gender	.52	.54	.09	.01	.01
Step 2:	Gender	.12	.55	.02		
	Cop_Emo	.06	.02	.25*		
	Mot_Cop	-.03	.06	-.04	.06	.05*
Life_Dia						
Step 1:	Gender	-.07	.25	-.02	.00	.00
Step 2:	Gender	-.22	.25	-.08		
	Cop_Emo	.02	.01	.21*		
	Mot_Enh	.08	.03	.29**	.17	.17**

Notes. [1] Life_Dia=number of lifetime substance use diagnoses as defined by SCID-IV, SDS=Substance dependence scale, Cop_Emo =emotion-oriented coping (CISS), Mot_Cop=Coping motives (DUMM), Mot_Enh=Enhancement Motives (DUMM).

* $p<.05$. ** $p<.01$

Table 8:

Hierarchical Multiple Regressions Exploring Significant Predictors of Alcohol and Cannabis Use using Non-transformed Coping Motives, Standard Drinking Unit and Standard Cannabis Units Variables

Variables[1]		*B*	*SE*	*β*	R^2	ΔR^2
DSDU					.	
Step 1:	Gender	-.59	1.65	-.03	.00	.00
Step 2:	Gender	.03	1.60	.00		
	BAS	.45	.23	.19*		
	Cop_Emo	-.13	.07	-.19		
	Mot_Soc	.58	.14	.39**	.18	.18**
DSCU						
Step 1:	Gender	-.24	.10	-.24*	.06	.06*
Step 2:	Gender	-.27	.10	-.27*		
	Cop_Emo	.01	.00	.22*		
	Mot_Soc	.02	.01	.22*		
	PA	.01	.01	.17	.24	.18**
DSCU						
Step 1:	Gender	-.24	.10	-.24*	.06	.06*
Step 2:	Gender	-.26	.09	-.25**		
	BIS	-.04	.01	-.30**		
	Cop_Avo	.01	.00	.19*		
	Mot_Cop	.02	.01	.21*		
	Anx	.03	.01	.44**	.45	.39**

Notes. [1] DSDU=Number of standard drinking units per day in the past month, DSCU=Number of standard cannabis units per day in the past month, BAS=Sensitivity to Reward, Cop_Emo=emotion-oriented coping (CISS), Mot_Cop=Coping motives (DUMM), Mot_Soc=Social Motives (DUMM), PA=positive affect (PANAS), Anx=General Distress: Anxiety (MASQ).

* $p<.05$. ** $p<.01$

Appendix D.2 Tables of results from correlational analyses and hierarchical multiple regressions conducted in study two using non-transformed variables

Table 1:

Correlational Matrix for Impulsivity Measures and Control Variables using Non-transformed Delay Discounting Task Score

Variable[1]	BAS	BIS-11	DDT	GoNo_N	GoNo_R	GoNo_D	Stroop	WTAR	DS
BAS	1.00	.22	.04	-.22	-.08	.26*	.22	.27*	.02
BIS-11		1.00	.08	-.04	-.11	-.11	.13	.21	.17
DDT			1.00	-.27*	-.32*	-.03	.11	-.13	-.01
GoNo_N				1.00	.83**	-.42**	-.08	.10	.19
GoNo_R					1.00	.16	-.01	.13	.17
GoNo_D						1.00	.14	.03	-.06
Stroop							1.00	.18	.12
WTAR								1.00	.59**
DS									1.00

Notes. [1] BAS=Sensitivity to Reward, BIS-11=Barratt Impulsiveness Scale, DDT=Delay Discounting Task, GoNo_N=Correct inhibition of red arrows in Neutral condition of Go/No-go task, GoNo_R=Correct inhibition of red arrows in Reward condition of Go/No-go task, GoNo_D=Difference in scores between conditions (Reward – Neutral), Stroop=Stroop Colour and Word Task, WTAR=Wechsler Test of Adult Reading, DS=Digit Span Task. * $p<.05$. ** $p<.01$

Table 2:

Pearson Product Moment Correlations Following Partial Correlations of Stroop, WTAR and DS using Non-transformed Delay Discounting Task Score

Variable[1]	BAS	BIS-11	DDT	GoNoN_Sc	GoNoR_Sc	GoNoD_Sc
BAS	1.00	.18	.07	-.22	-.10	.23
BIS-11		1.00	.09	-.06	-.15	-.13
DDT			1.00	-.27*	-.32*	-.04
GoNo_N				1.00	.82**	-.41**
GoNo_R					1.00	.18
GoNo_D						1.00

Notes. [1] BAS=Sensitivity to Reward, BIS-11=Barratt Impulsiveness Scale, DDT=Delay Discounting Task, GoNo_N=Correct inhibition of red arrows in Neutral condition of Go/No-go task, GoNo_R=Correct inhibition of red arrows in Reward condition of Go/No-go task, GoNo_D=Difference in scores between conditions (Reward – Neutral).

* $p<.05$. ** $p<.01$