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Personality and motivational determinants of alcohol use

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Bangor University
School of Psychology

**Personality and Motivational Determinants of
Alcohol Use**

Volume 1

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List of Abbreviations

Abbreviation

| | |
|--------|---|
| Anx | Anxiety |
| BAS | Behavioural Approach System |
| BIS | Behavioural Inhibition System |
| DSM-IV | Diagnostic and Statistical Manual of Mental Disorders Version Four |
| E | Extroversion |
| FFFS | Fight-Flight-Freeze System |
| Imp | Impulsivity |
| N | Neuroticism |
| RST | Reinforcement Sensitivity Theory |
| SP | Sensitivity to Punishment |
| SR | Sensitivity to Reward |

Summary

The purpose of this thesis was to (a) identify the Reinforcement Sensitivity Theory (RST) constructs that can be applied to addiction research, and (b) systematically test RST constructs with drinking determinants derived from Cox and Klinger's motivational model of alcohol use.

In the first study, age, age of drinking onset, and sensitivity to reward (SR) predicted students' alcohol use ($n = 273$): SR was found to be the best predictor among those drinkers who had alcohol-related personal life concerns, after controlling for the demographic variables ($n = 131$), whereas sensitivity to punishment (SP) was not related to alcohol use.

The second study partially replicated these findings, and extended them by identifying two profiles that might increase the risk of excessive drinking for affective regulation in student drinkers ($n = 207$). Each profile contained determinants that were alternative representations of Cox and Klinger's motivational pathway, which terminates in the final decision to drink. Unlike Study 1, low-SP (sometimes termed "fearlessness") was related to high alcohol consumption; the relationships between SP, avoidance motivational structure, and drinking determinants were interpreted as indicators of "emotional-vulnerability" drinking (for coping and negative affect regulation reasons). The relationships between SR, approach motivational structure, and drinking determinants (coping reasons, emotional dysregulation, enhancement and coping motives) were interpreted as indicators of "emotional-reward" drinking (for coping and positive and/or negative affect regulation reasons).

The third study tested the relationships between RST constructs and alcohol reinforcement drinking among students ($n = 138$) with an experimental paradigm that combined a mood-induction procedure with an alcohol-taste test. Students' SP scores

were positively related to their negative reinforcement drinking scores, and SR scores were positively related to their positive and negative reinforcement drinking scores. Study 3, failed to achieve most of its primary objects because of participant characteristics and methodological confounds. The study failed to find any support for its main hypotheses, but it still managed to identify a significant main effect for positive mood-induction condition. Participants in this condition were found to consume more alcohol during the taste-test than those participants in the negative and neutral conditions. The findings regarding SR scores and alcohol consumption were consistent with those for Studies 1 and 2. Likewise, the findings for SP and alcohol consumption were also consistent with those reported in Study 2.

Overall, RST constructs were useful in categorising students' drinking within the framework of Cox and Klinger's model: SR scores were found to be positively related to self-reported alcohol use in each study, whereas SP scores were found to be negatively related to alcohol use in Studies 2 and 3 only. Therefore, SR motivated behaviour is considered to be more of a risk factor for excessive drinking among young social drinkers than SP motivated behaviour. SR might be perceived to be an aetiological factor of excessive drinking and SP a maintenance factor. The implications of these results for future research include a better understanding of the multiple determinants of drinking behaviours, risk identification, and the design of targeted interventions.

CHAPTER 1

Introduction: Alcohol Use and Models of Alcohol Use

The obtaining of enjoyment from drinking fermented beverages and distilled spirits is not a modern phenomenon; this tradition can be traced back to the beginning of early human civilisation. The drinking of alcohol is part of our ancestral and cultural heritage. According to the Office for National Statistics (ONS, 2001), 63% of males and 69% of females in the United Kingdom are moderate drinkers of alcohol. This chapter presents a brief history of alcohol use, followed by a review of the early and current models of alcohol use and/or alcoholism.

A Brief History of Alcohol Use

It has been proposed that the process of fermenting started in the Neolithic period (the Stone Age), and that the development of alcohol production techniques was advanced by early civilisations. Hanson (1995) reviewed the historical documents and presented an overview of early alcohol production and use. According to this source, wine was produced by the early Egyptians in 4000 B.C., and beer and wine were used for symbolic and functional reasons as early as 2000 B.C. (e.g., for religious and medical reasons). The early Chinese civilisation, in 7000 B.C., was fermenting a type of wine from rice, honey, and fruit; the early Indian civilisation was fermenting Sura from rice meal between 3000 and 2000 B.C. Around 2700 B.C. beer consumption was common among the ancient Babylonians and mead consumption was popular in 2000 B.C. among the ancient Greeks. In 1700 B.C. wine fermenting was a common practice in ancient Greece. Processes for distilling spirits were

invented by the ancient Persian alchemists in the 8th and 9th centuries. The modern term 'alcohol' is generally said to have entered into the English language around 1543 from the Arabic (Hanson, 1995).

Throughout antiquity alcohol has served many ceremonial, spiritual, religious, symbolic, functional, and cultural functions. It was consumed as a source of nutrition, or for analgesic reasons, or for enjoyment reasons (Hanson, 1995). One pattern of human behaviour that appears to have stayed fairly consistent since these early civilisations, and that is still prevalent in today's modern society, is the tendency for some people to drink safely and responsibly, and unfortunately for others to drink unsafely and irresponsibly. Hence, drunkenness, inebriety, or alcoholism is not a modern societal problem, but one that is as old as human civilisation. For example, the early Egyptian, Chinese, and Persian civilisations either advocated some form of moderation (except during religious and ceremonial festivals) or condoned drunkenness to some degree (Hanson, 1995). In fact, around 1116 B.C. a Chinese Imperial Edict proclaimed that moderation was prescribed by heaven; this is probably one of the oldest alcohol-related laws.

Beer became popular in England during the Middle Ages (5th to 16th centuries). During this time period it was illegal to adulter (add water to) beer or wine, and in Scotland this crime was punishable by death (Hanson, 1995). Ales, stouts, beers, and meads or ciders were generally consumed by the lower classes of Elizabethan and Stuart society, whereas wines tended to be consumed by the middle and upper classes of these two societies. Gin and other distilled spirits became popular in England during the 17th century, when England experienced its darkest period of alcohol-related history. Thus many people became addicted to gin in poor urban inner city areas and died from "Dropsy", which is a form of alcoholic liver disease, whereas

rural communities continued to consume beers, stouts, ales, ciders, and wines (London, 2005).

Today, the United Kingdom is experiencing many social and economic problems because of excessive drinking. Varney and Guest (2002, p. 891) estimated that alcohol misuse costs the Scottish economy over 1 billion pounds per year and Raistrick (2005) stated that alcohol misuse costs the United Kingdom's economy approximately £20 billion a year, which is £6 billion more than the tax revenue for alcohol sales. According to the United Kingdom's Department of Health (DOH) guidelines (1995), men should drink no more than 21 units of alcohol per week, this equates to no more than three or four units in any one day. Whereas, women should drink no more than 14 units of alcohol per week, and this equates to no more than two or three units in any one day. However, in 2002 it was estimated that 27% of men and 17% of women drink in excess of these recommendations (Raistrick, 2005). Raistrick goes on to claim that 7% of males and 3% of females are drinking over dangerous limits (50 and 35 units of alcohol per week, respectively), and that there are approximately 7 million hazardous or harmful drinkers in the United Kingdom and 1 million dependent drinkers. In addition, the safe, sensible, social consultation report (DOH 2008) states that there were 81 1000 alcohol-related hospital admissions between 2006 and 2007. The report goes on to claim that more than 10 million adults regularly drink at levels that exceed the sensible drinking guidelines.

Jeffries, Power, and Manor (2005), estimated that 46% of men and 30% of women between the ages of 25 and 44 binge drink regularly. This pattern of drinking is elevated in the 16 to 24 year old age range, where 49% of men and 39% of women binge drink on a regular basis. The major problem with defining binge drinking is that there is no one singular definition in the addictive behaviours literature, it is

sometimes termed heavy episodic drinking, or risky single occasion drinking, or heavy sessional drinking (Gill, 2002). Furthermore, the amount of alcohol that a person needs to consume for the drinking pattern to be recorded as a binge drinking episode varies with each definition of binge drinking (e.g., > 7 units in a session for females and > 10 units in a session for males, figures that surpass more than half the weekly sensible drinking level for each gender).

It can be argued that the United Kingdom's pattern of societal and cultural drinking is cyclic and has been occurring for at least 458 years, reckoning from the first known edict designed to control public drinking, with some fluctuations in the amounts of alcohol consumed per capita. In the United Kingdom, the per capita consumption of alcohol increased from 6.61 litres in 1973 to approximately 10 litres in 2003 (Raistrick, 2005). The early fluctuations in per capita consumption in British history are mainly due to the legal restrictions imposed during the "Gin Epidemic" and the First and Second World Wars. Table 1.1 presents a summary of key dates in British history with respect to the alcohol-related events. The table was independently compiled by the present researcher from published sources (Hanson, 1995; London 2005; Raistrick, 2005; Thom, 2005).

Table 1.1.

Key dates in British history with respect to the alcohol-related events.

| Date | Historical Event |
|-------------|---|
| 1550 – 1575 | Thomas Nash(e) states that inebriety is widespread amongst Elizabethan English society. Drunkenness is mentioned for the first time as a crime and parliament introduces laws to control it. |
| 1600 – 1625 | During the reign of James I, drunkenness from beer (or ale) and wine is widespread amongst all classes of English society. This pattern of behaviour continued into the early 18 th century. |
| 1606 | The English parliament passes the “Act to repress the odious and loathsome sin of drunkenness”. |
| 1643 | Britain imposed taxation on distilled spirits and the distilling of illegal moonshine began. |
| 1650 – 1675 | Gin or Junever or Geneva is distilled in Holland (1650) and introduced into Britain by soldiers returning from the wars in the Low Countries (part of Holland that used to border the Rhine, Scheldt, and Meuse rivers). In Britain gin distillation becomes widespread. |
| 1676 – 1700 | In 1690 the English aristocracy supported laws that encouraged the distillation and sale of spirits for taxation purposes. Gin production increased rapidly, so did its abuse amongst the poorer classes of society. The middle and upper classes at this time still continued to consume excessive amounts of beer and wine. |
| 1701 | The need for a licence to sell spirits was abolished by the English parliament. |
| 1740 – 1742 | There were more burials than baptisms in London during the “Gin Epidemic”. |
| 1750 | 11 million gallons of gin were consumed in England. The English parliament: (a) increased the taxation on gin, (b) reduced the number of outlets that could sell spirits, and (c) prohibited the reclaiming of debts for alcohol that was sold on credit. These measures helped to control and bring an end to the English gin epidemic. |

Table 1.1. Continued

Key dates in British history with respect to the alcohol-related events.

| Date | Historical Event |
|-------------|--|
| 1750+ | Spirits were viewed as being morally bad, whereas beers and wines continued to be viewed as “healthy beverages”. |
| 1800+ | The English temperance movement which was influenced by the Quakers condemned the drinking of spirits, but promoted and drank beer and wine. Later the temperance movement advocated that people should abstain from alcohol. |
| 1914 – 1918 | During the first world war drunkenness was damaging production and the war effort, so the government cut public houses opening hours. The country also reduced its alcohol production. Deaths from liver cirrhosis dropped to a third of the pre-war figures. |
| 1920 – 1946 | The opening hour restrictions that were imposed during the first world war remained in place and the number of convictions for drunkenness dropped from 96000 in 1920 to 20000 in 1946. |
| 1950 | Alcohol consumption was estimated to be 5.2 litres per capita. |
| 1950+ | The recorded alcoholism rates in Britain were small, and as such no major alcohol treatment policies were introduced by parliament. Alcoholism was seen as being part of another illness, such as depression and anxiety. |
| 1958 – 1961 | A Joint report by the British Medical Association (BMA) and Magistrates Committee published in 1961 recommended that specialist alcoholism treatment units should be set up under psychiatric management. |
| 1962 – 1968 | Memorandums supported the use of inpatient and outpatient alcoholism treatment centres in Britain. |
| 1970 – 1979 | In 1975 the Advisory Committee on Alcoholism was set-up to advise the British parliament. In 1979 proposals to increase the taxation on alcohol and measures to control alcohol consumption and availability were generally ignored by the British parliament. |
| 1980 | The British Home Office continues to deal with alcohol related issues. |
| 1981 | The DOH published the “Drink Sensibly” paper. |

Table 1.1. Continued

Key dates in British history with respect to the alcohol-related events.

| Date | Historical Event |
|-------------|---|
| 1990 – 1995 | Large increases in drunkenness, the so called “Lager Lout period”, with increases in underage drinking, and alcohol-related crime. In 1995 the Department of Health (DOH) published the “Sensible Drinking Limits” report, which gave guidelines for daily intake. |
| 1999 | The DOH and Alcohol Concern published the “Proposals for a National Alcohol Strategy for England”. |
| 2004 | The Cabinet Office published “The Alcohol Harm Reduction Strategy for England”, to help reduce England’s alcohol-related problems. Scotland (2002), Wales (2000), and Northern-Ireland (2000) developed harm-reduction strategies. |
| 2005 | British parliament introduced a law to extend public house opening hours to 24hrs. In general, this has done very little to change Britain’s binge drinking culture. Alcohol Concern estimates that 3.8 million Britons are addicted to alcohol and dealing with alcohol misuse costs Britain 3.3 billion a year. |
| 2008 | The Welsh Assembly Government introduces the “Working Together To Reduce Harm”, a 10 year strategy to deal with the country’s binge drinking culture and illegal drug problems. According to the Welsh Assembly alcohol and illegal drug use costs the Welsh economy £2 billion a year, of that £85 million a year is for Health Service costs. |

As shown in Table 1.1, the United Kingdom is now attempting to deal with its societal alcohol misuse and the resultant problems. The United Kingdom still has a long way to go before it can find an adequate solution to these societal problems. The next part of this chapter reviews the aetiological models of alcohol use and alcoholism that have shaped the standard prevention, harm-reduction, community, intervention, and treatment programmes of the United States of America and the United Kingdom. Most of these early theories or models were developed in America.

They aimed to explain why some people—but not others—drink excessive, hazardous, or harmful amounts of alcohol.

Aetiological Accounts of Problematic Alcohol Use

Alcohol Abuse and Dependence

Substance abuse is defined as the excessive use of a substance such as alcohol, caffeine, and tobacco (Cox, 1985). Alcohol abusers might experience the same deleterious effects as alcoholics from excessive drinking, but excessive drinkers are said to lack the physical dependence and impaired control characteristics of alcoholics (Chick, 1993). Alcohol abuse was defined by the American Psychiatric Association (APA) in 1994, to satisfy the criteria specified in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) a person must (a) be clinically impaired or distressed and (b) not meet the criteria for alcohol dependence. To be diagnosed as clinically impaired or distressed a person must have experienced the symptoms associated with one of four criteria in the last twelve months. These criteria include: (a) recurrent use of alcohol, which has resulted in the failure to meet obligations at work, school (or college or university), or home, (b) recurrent use of alcohol in situations that are physically hazardous or dangerous, (c) recurrent alcohol-related legal problems, and (d) continued alcohol use despite experiencing persistent or recurrent social or interpersonal problems that are caused or exacerbated by the effects of alcohol (DSM-IV, 1994). Alcohol abuse is probably more common among younger than older people, although this does not imply that there are no older alcohol abusers or young dependent drinkers.

The term ‘alcoholism’ is a relatively modern one; its origins can be traced back to Magnus Huss (1849), who was the court physician to the Swedish kings. Huss was the first person to use the term medically when systematically classifying the deleterious physical and mental effects of alcohol abuse. Huss concluded that beer and wine can have the same damaging effects as distilled spirits. This was considered to be a radical proposal for its time, because it was generally accepted that beer and wine had little negative impact on the body, whereas distilled spirits were considered to be the most dangerous alcoholic beverages. For example, Increase Mather, who was a 17th century American Puritan minister, advocated the use of alcohol but condoned its abuse. He is reported saying that, “Drink is in itself a good creature of God, and to be received with thankfulness, but the abuse of drink is from Satan; the wine is from God, but the Drunkard is from the Devil.” (quoted in Rorabaugh, 1979, p. 30). This opinion was held in many westernised societies. Beer and wine were considered better and safer to drink than water, which at that time in many western civilisations tended to be polluted with raw sewage and other pathogens such as cholera and typhoid (Hanson, 1995).

The modern and current usage of the term alcoholic became prevalent in 1952 when the World Health Organisation adopted Jellinek’s medical definition, which states that, “Alcoholics are those excessive drinkers whose dependence on alcohol has attained such a degree that it shows notable disturbance or an interference with their bodily and mental health, their personal relationships and smooth economic functioning or who show prodromal signs of such development. They therefore need treatment.” (Jellinek, 1952)¹ Jellinek (1960) went on to state that there are different

¹The prodromal phase of an illness is the pre-symptom phase of the full disorder.

types of alcoholics, such as 'gamma' and 'delta' alcoholics. Gamma alcoholics are those drinkers who are unable to stop drinking, and delta alcoholics are those drinkers who are unable to abstain from drinking (Miller & Kurtz, 1994).

Like alcohol abuse, alcohol dependence was defined by the APA in 1994. The criteria for alcohol dependence include cognitive, behavioural, and psychological symptoms. To meet the criteria a person must have experienced three or more of the following symptoms in the last twelve months: (a) increased tolerance to alcohol, (b) marked withdrawal symptoms, (c) alcohol is consumed in larger amounts over a longer period of time, (d) there is a persistent desire to cut down or control alcohol use, (e) a larger amount of time is spent in the pursuit of, use of, or recovery from alcohol, (f) neglects alternative pursuits and pleasures, and (g) continued use despite experiencing harmful consequences (DSM-IV, 1994). The diagnosis can also be given with and without physiological dependence (tolerance and withdrawal).

Hester and Miller (1989) reviewed the literature and concluded that there are eleven prominent aetiological models of alcoholism, alcohol abuse, or misuse that have shaped the standard prevention, intervention, and treatment programmes of westernised societies. The next part of this chapter summarises these models. A full review of the advantages and disadvantages of each model is beyond the scope of this thesis, because the published literature is full of claims and counterclaims about the utility of each model. Most current addiction researchers would probably agree that we now know more about alcohol use and excessive drinking than most of the early unitary models can comfortably explain or account for. The brief overview of each model is presented in the order that they were reviewed in by Hester and Miller (1989), and by Hester and Sheeby (1990). It should be noted that the term model is here used in a fairly broad sense, not restricted to coherent theories (as in present

psychological literature), to include key movements and beliefs that have informed society's views of alcohol use and misuse over the last two centuries.

Moral-Volitional Model

According to Miller and Kurtz (1994), the moral-volitional model is the oldest account of drunkenness (this historical term was used before Huss coined the term alcoholism). This model views alcoholism as a volitional choice or wilful action, in which alcoholics consciously decide to drink alcohol. In short, the moral-volitional model holds that alcoholism is due to some form of moral deficit, a demonic possession, a sin, or a wilful violation of societal rules and norms (Hester & Miller, 1989). Miller and Kurtz go on to state that the perspective that alcoholism is a volitional choice is still prominent today, especially in the criminal justice system, which continues to blame alcoholics for the crimes they commit whilst under the influence of alcohol. In fact, the American Supreme Court ruled that alcoholism should be regarded and treated as "wilful misconduct" (Connors & Rychtarik, 1988). Community prevention programmes that adhere to this model attempt to reduce the negative impact of alcohol on society by promoting "Just Say No" campaigns, which are designed to encourage people to consciously decide not to drink.

A fundamental problem with this model is that it assumes that the final decision to drink is always a conscious one; it does not account for the unconscious processes that can also contribute to the final decision to drink. How nonconscious processes contribute to the final decision to drink is discussed in Cox and Klinger's (2004) motivational model of alcohol use, which is reviewed in Chapter 2 of the present thesis. At a fundamental level the moral or volitional model excludes

environmental and pharmacological determinants of alcohol misuse and alcohol-related problems.

Temperance Model

This model was originally developed in the 1800s, and at the beginning the temperance movement emphasised the moderate use of alcohol, but as the movement became politically influential its stance on alcohol became more extreme, it began to view alcohol as a dangerous drug that no one should use (Hester & Sheeby, 1990). The political influence of the temperance movement came to fruition in 1920 when the American Congress passed the 18th amendment to the constitution, which started the American prohibition era (Hester & Miller, 1989). The end of the temperance movement was brought about by the repeal of the Prohibition Act in 1933 (the 21st amendment to the constitution). Although the prohibition era was unpopular, it was successful in reducing alcohol consumption and alcohol-related problems. According to Hester and Sheeby (1990), some of the key assumptions of the temperance movement have survived and continue to influence current theoretical perspectives. For example, the model identified that alcohol was a dangerous drug, an idea that subsequently promoted further research into the deleterious physical consequences of excessive alcohol use. Hester and Sheeby go on to state that how the temperance movement viewed alcohol is comparable to how cocaine, marijuana, and heroin are presently viewed, as dangerous drugs with high individual and societal costs. In short, the temperance model and movement sees alcohol itself as the cause of society's alcohol-related problems (Hester & Miller, 1989).

According to the principles of the temperance model, community prevention and intervention programmes should be delivered by abstainers, who can act as role

models to encourage others to abstain, such as the support networks found among Alcoholics Anonymous (AA). At a legislative level the model advocates that the availability and advertising of alcohol should be restricted and reduced. Although this movement enforced abstinence, abstinence from alcohol is still a core aspect of many models of alcohol use that form the theoretical foundations of standard alcoholism treatment programmes (e.g., the disease or medical and biological models). At a fundamental level, this model like the moral-volitional model excludes the environmental determinants of alcoholism and alcohol related problems, and it also fails to consider intraindividual and interindividual factors.

Dispositional or Disease Model

This model became prevalent in the 1930s and 40s; at the same time, Alcoholics Anonymous started in 1935. The conceptual origins of this model can be traced back to the 18th and 19th centuries. Psychologists in the 19th century drew on the 18th century observations of Dr. Benjamin Rush (who was prominent in the temperance movement), and worked on the premise that inebriety, or chronic drunkenness, or alcoholism might be a disease. In 1920 the prohibition act and prohibitionist and temperance movement stopped this line of research, but it was recommenced after the prohibition act was repealed in 1933 (Miller & Kurtz, 1994).

Milam and Ketcham (1983) noted the four key assumptions of the disease model. The first assumption is that alcoholism is a unitary disease which is qualitatively distinct and discontinuous from normality, thus, one either is or is not an alcoholic. The second assumption is that the underlying causes of alcoholism are biological by being the result of heredity and physiological processes. Milan and Ketcham go on to state that the disease model sees the behavioural, family, and

personality disturbances as being solely symptoms of the body's abnormal reactions to alcohol. The third assumption is that an alcoholic's inability to control alcohol consumption after the first drink is a cardinal symptom of alcoholism. This deficit in control is also seen as being the result of the body's reactions to alcohol, also a result of physiological processes. Denial is also another cardinal symptom of alcoholism, alcoholics will deny that they have a problem until they are strongly confronted (Hester & Sheeby, 1990). The fourth and final assumption of the model is that alcoholism is a condition that is irreversible and incurable. However, the model does posit that alcoholism can be palliated and managed through total abstinence from alcohol (Miller & Kurtz, 1994, p. 160). In short, this model assumes that alcoholism is a progressive condition or disease in which the individual gradually or rapidly loses control over alcohol (Hester & Miller, 1989).

There are three fundamental problems with the disease model. First, according to Miller and Kurt (1994), Milam and Ketcham's model is twofold because it states that one is either an alcoholic who needs treatment or one is not an alcoholic and does not need treatment. It was this dichotomy that Jellinek's 1960 disease model cautioned against by defining different alcoholic stages. Second, it assumes that alcoholics are not personally responsible for their alcohol use, and are unable to make rational decisions about their prognosis and treatment, because they have no self-governance over the disorder or themselves. Third, the disease model does not consider fully the psychological aspects of alcoholism or the recovery from it by treating alcoholism as a physiological abnormality (see Chick 1993; Milam & Ketcham 1983; Miller & Kurtz, 1994).

What is interesting about the disease model is that it was readily accepted and promoted by the drinks industry, as it removed the blame from alcohol itself and

shifted it to physiological abnormalities within certain people. This perspective, according to Hester and Miller (1989, p. 6), is nonsensical because it asserts that alcoholism is not caused by alcohol. The model also has another peculiar assumption; it posits that there are alcoholics who have never had a drink, so they do not know that they are alcoholics.

The advocates of the disease model do not blame alcoholics for their alcohol-related problems because they view alcoholics as being incapable of making rational decisions when it comes to drinking (Hester & Miller, 1989; Miller & Kurtz, 1994). The standard treatment developed from this model is detoxification accompanied by education about the disease process, encouragement, medication to help clients abstain from alcohol (e.g., Antabuse and Campral), and medical procedures such as vitamin B supplements to alleviate nutritional deficits (Milam & Ketcham, 1983). However, some disease or medical models do recognise the importance of psychological factors and see psychological therapies as being a beneficial adjunct to treatment as usual, such as the use of cognitive behaviour therapy. Other intervention strategies include peer support groups like A.A. in which recovering alcoholics help other alcoholics to recognise, accept, and adjust to their disease (Hester & Miller, 1989). Like the moral, educational, personality, and biological models the disease model emphasises the importance of the intraindividual determinants of alcoholism, but it fails to take into account the environmental and pharmacological factors.

Educational Model

The core aspects of this model are simple in comparison to those for the moral, temperance, and disease models. Implicit in educational models is the perspective that alcoholism is the result of a deficit in knowledge about the harmful

effects of alcohol or excessive drinking (Hester & Sheeby, 1990). Hence, once people become aware of how alcohol can damage them, their family unit, and society, they will reduce their alcohol intake or abstain completely. Prevention and harm-reduction programmes based on this model usually deliver lectures and films to various populations, such as school children, college or university students, co-morbid participants, alcoholics who are not in treatment, alcoholics who are in treatment, recovering alcoholics, and criminal offenders like drink-drivers. Some educational programmes include affective components to further encourage the motivation to change or avoid excessive drinking (Hester & Miller, 1989). In a similar manner to the moral, disease, personality, and biological models the educational model accounts for the intraindividual or interindividual determinants of alcoholism, but it fails to take into account the environmental and pharmacological factors.

Personality or Characterological Model

This model posits that alcoholism is a symptom of an underlying personality disorder that disturbs or arrests normal development; its origins can be traced back to the emergence of psychoanalysis in the early 20th century (Miller & Kurtz, 1994). These early psychoanalysts claimed that alcoholics are immature and fixated at an early stage of development (e.g., Strecker, 1937). In the following years, a myriad of personality traits have been associated with the initiation, development, maintenance, and subsequent relapse to alcohol use, such as extroversion, impulsivity, rash-impulsivity, sensation-seeking, novelty-seeking, reward-seeking, sensitivity to reward, reward-dependence, neuroticism harm-avoidance, punishment-avoidance, sensitivity to punishment, and anxiety. An alternative personality model of alcohol use, the Reinforcement Sensitivity Theory is reviewed in Chapters 2 and 3 of the

present thesis. Chapter 2 also reviews Cox and Klinger's motivational model of alcohol use, which proposes that personality is a distal determinant of alcohol use. Chapter 3 also reviews the personality traits that have been identified as risk factors for excessive and problematic drinking, which were deemed by early psychologists to be indicators of an alcoholic personality (see Barbara, 1945; Mulder, 2002). This thesis takes the view that there is no such thing as an alcoholic personality per se, but a number of core traits that are risk factors for excessive and problematic drinking have been identified in the literature.

In short, regarding the personality or characterological model of alcoholism, psychotherapy is seen as being the most appropriate treatment for restructuring personality (Hester & Miller, 1989; Hester & Sheeby, 1990; Miller & Kurtz, 1994). Current theorists propose that substance misuse treatment programmes should consider personality traits when they are designing interventions because they can affect retention, relapse, and outcome rates (see Conrod, Castellanos, & Mackie, 2008; Staiger, Kambouropoulos, & Dawe, 2007). Like the other early models, the personality model also accounts for some of the intraindividual and interindividual determinants of alcoholism and alcohol-related problems, but it does not account fully for the environmental and pharmacological factors. The relationship between personality predispositions and the neuropharmacological aspects of alcohol use is discussed in Chapter 6 of the present thesis.

Conditioning Model

Like the educational model, the general principles of this model are also clear and simple, in that excessive drinking is viewed as being a pattern of learned behaviour that has been reinforced (Hester & Sheeby, 1990). Chapter 2 of the present

thesis addresses some of the learning and reinforcement aspects of alcohol use, whereas Chapter 6 reviews the learning, reinforcement, and neuropharmacological aspects of alcohol use. A key issue not addressed in Chapters 2 and 6 is “enabling”. In general conditioning models, the term enabling refers to the possibility that those people close to an alcoholic indirectly reinforce excessive drinking by removing the negative consequences (Hester & Miller, 1989).

By being a learned habit, excessive drinking can be changed through relearning and different patterns of reinforcement (Hester & Sheeby, 1990). The standard treatments and interventions derived from this model include counterconditioning with aversion therapy (a classical conditioning approach), or community reinforcement approaches which are designed to alter contingencies for drinking and sobriety (termed disenabling, an operant conditioning approach). Other strategies include learning new ways and skills to deal with the stressors that precede and hasten episodes of excessive drinking (e.g., coping-skills training). Learning based prevention programmes can be used to reduce the impact of factors that promote positive alcohol associations and contingencies, which might encourage episodes of excessive alcohol use, such as advertising and two-for-one happy hours (Hester & Sheeby, 1990). In a similar fashion to the general systems and sociocultural models of alcoholism, the conditioning model accounts for the environmental determinants of alcoholism, but fails to fully account for the interindividual and intraindividual factors. The conditioning model does apply to the pharmacological and neuropharmacological aspects of alcoholism and alcohol-related problems.

Biological Model

This model became prevalent in the 1970s and it is sometimes confused with the disease or medical model because it focuses on the genetic and physiological processes of excessive drinking. The genetic components are supported by research findings which show that there are higher levels of alcoholism among the offspring of alcoholics, even when they are not raised by their biological parents. Other physiological factors include abnormal alcohol metabolism, brain sensitivity, and the pharmacological aspects of alcohol addiction (Hester & Miller, 1989; Hester & Sheeby, 1990). Chapter 6 of the present thesis reviews the neuropharmacological aspects of alcohol use alongside the learning and reinforcement aspects of alcohol use that can be associated with the functioning of two motivational brain systems (reviewed fully in Chapter 2).

Intervention or prevention programmes designed on the biological model usually attempt to identify those who are most at risk from developing alcohol-related problems because of hereditary factors, physiological processes, or pharmacological addiction. At risk individuals can be given generic or genetic counselling to emphasise the risk factors and encourage them to reduce, control, or abstain from drinking (Hester & Miller, 1989). Again, like the moral, disease, educational, and personality models the biological models accounts for some of the intraindividual or interindividual determinants of alcoholism and alcohol-related problems, but fails to account for the environmental factors.

Social Learning Model

Social learning model is considered by Hester and Miller (1989) to be an extension of the conditioning model of alcoholism. Social learning theory model focuses on the social context in which excessive drinking occurs. This model considers a multitude of causal factors, these being coping skills, peer pressure, the modelling of excessive drinking², positive alcohol expectancies, and psychological dependence. Excessive drinking in this model is viewed as being a strategy for altering psychological states and coping with stressors or problems. Hester and Miller (1989) consider the reliance upon a drug to alter affective states and to cope with stressors and problems as being an indicator of psychological dependence. Coping behaviour, emotional regulation, and drinking motives as determinants of alcohol use are reviewed in Chapter 4 of the present thesis. Drinking for affective change is also addressed in Chapter 2 of the present thesis.

One of the advantages of the social learning theory model is that it takes the perspective that alcoholism and alcohol use are multidetermined behaviours, rather than focusing on singular determinants like the moral-volitional, temperance, disease, personality, and education models. The interventions that can be derived from this model include relapse prevention, coping skills training, emotion regulation training, and strategies for altering a person's relationship with his or her environment, and cognitive restructuring, which can be used to weaken positive associations with alcohol (e.g., expectancies). Prevention programmes can focus on the antecedents in the environment that promote positive alcohol associations, provide heavy-drinking

² In regards to modelling, heavy drinking companions have been shown to evoke increased alcohol consumption among those around them (Hester & Miller, 1989, p. 7).

models, or which promote the use of alcohol to alter psychological states and cope with stress (Hester & Miller, 1989). This model does not fully take into account the pharmacological aspects of alcohol use.

General Systems Model

This model claims that alcohol abusers are just one part of a larger social system and that the main social system in society is the family. In short, this model holds that people might become alcoholics if they are raised in and become part of a dysfunctional family, because the family tries to maintain the family's status quo and dynamics by being resistant to change (Hester & Sheeby, 1990). The family systems approach extends this perspective by claiming that a person's alcoholism represents a coping strategy with the family structure and system (Hester & Miller, 1989, p. 8). The general systems model has also been applied to the children of alcoholics, and states that these children manifest personality psychopathologies that increase the risk for alcohol-related problems or the development of unhealthy relationships. This perspective is similar to the biological models genetic account of alcoholism. Some systems model advocates hypothesise that these personality psychopathologies might be passed on to the first and second generation offspring of alcoholics (see Thanepohn, 1986).

The main intervention based on this model is systems-orientated family therapy, which attempts to treat the alcohol abuser and family group at the same time, because if the alcohol abuser was treated individually the family may become resistant to change. Other strategies include peer groups that help the alcohol abuser to work through his or her dysfunctional family history; by doing this the alcohol abuser should move toward a more adaptive lifestyle (Hester & Miller, 1989; Hester

& Sheeby, 1990). Again, like the conditioning and sociocultural models, the general systems model gives a good account of the environmental determinants of alcoholism and alcohol-related problems, but it fails to account for the pharmacological factors. However, the general systems model does consider intraindividual and interindividual personality psychopathology factors of alcoholism and alcohol-related problems.

Sociocultural Model

This model shares similarities with the general systems model by viewing the environment that an alcoholic functions in. The main focus of the model is societal and sub-cultural drinking norms; thus the more alcohol a society or sub-group drinks the more alcohol-related problems it will encounter (Hester & Miller, 1989; Hester & Sheeby, 1990). Another key tenet of the model is that the environment in which an alcoholic tends to drink will have a direct influence and impact on how much alcohol that person will drink. For example, if the environment promotes drinking the alcoholic is more likely than not to drink (see Chapter 2 for a discussion of this point in the review of Cox and Klinger's motivational model of alcohol use).

Other societal and cultural determinants include: the level of societal distress among deprived and non-deprived socioeconomic groups, alienation, societal and cultural encouragement and punishment for drunkenness, general societal attitudes towards the pros and cons of alcohol, and the symbolic or functional importance of alcohol within society or the sub-group (Hester & Miller, 1989, p. 8). The societal symbolic and functional determinants are far reaching, in that they can be identified in most westernised social and familial gatherings when people celebrate an important

event, such as a birthday, an engagement, a wedding, or simply socialise at the end of the working week or gather for a barbeque.³

Interventions and programmes derived from this model attempt to change societal alcohol norms, restrict the availability of alcohol, increase the taxation on alcoholic beverages, and regulate the number of premises that sell and promote alcohol by reducing the number of outlets, controlling the opening hours, and calling for a ban on alcohol advertising, which might help to reduce the social norms or positive expectancies that society associates with alcohol and alcohol use (Hester & Miller, 1989; Hester & Sheeby, 1990). Although, the sociocultural model is promising, it like the conditioning and general systems models also fails to account for the intraindividual, interindividual, and pharmacological aspects of alcoholism or alcohol-related problems.

Public Health Model

As can be seen from the present review, most of the early models of alcoholism are unitary in nature. More recently, public health researchers concluded that the early models of alcoholism were useful starting points, but they failed to account for the interactions between the various determinants of alcoholism. By contrast, public health researchers viewed alcoholism and alcohol use as multidetermined behaviours (see Ashley & Rankin, 1988). From this perspective the public health model, which incorporates many biopsychosocial aspects of alcoholism, was developed.

³ The general consensus in Great Britain appears to be that the event is not enjoyable if alcohol is not present in copious amounts.

The public health model considers the interactions between three fundamental factors: (1) the agent (ethanol or alcohol), (2) the host (the alcoholic or alcohol abuser), and (3) the environment, such as family, social, cultural, and socioeconomic factors (Hester & Miller, 1989). Agent factors include the cellular actions of alcohol, how alcohol damages the human body's vital organs, and the interactions between alcohol and other disease processes (e.g., diabetes). The host factors include biological, social, and psychological determinants that are said to influence and mediate drinking (e.g., genetic predispositions, personality psychopathologies, positive alcohol expectancies, and drinking motives). Lastly, one of the most important environment factors is sociocultural drinking norms, as proposed by the sociocultural model. Like this model, the public health model also advocates that the availability of alcohol should be controlled and reduced (Hester & Sheeby, 1990).

In short, multidimensional models of alcoholism like the public health model are now considered by most contemporary addiction researchers to play an important part in the development of prevention and treatment programmes for alcoholism and alcohol-related problems. Hester and Sheeby (1990) claimed that numerous interventions can be derived from this model, such as opportunistic brief interventions, public health campaigns, reducing the availability of alcohol or increasing the taxation on it, harm reduction strategies, and alcohol screening programmes. They go on to claim that the public health model is superior to the early models of alcoholism because it advocates that different treatments can be delivered to different people. However, in practice, this would depend on what funding and services are available to the service provider at the point of contact with the client.

Summary and Conclusions

This chapter shows that alcohol production and consumption is as old as human civilisation, and that it is not just today's modern societies that have had to deal with some people's tendencies to consume excessive amounts of alcohol and experience alcohol-related problems. It appears that excessive drinking is firmly established in our culture, a problem that at best can only be managed. No portion of today's society is risk-free from the ravages of alcohol misuse.

This chapter also highlights the key factors and failings of the early unitary models of alcoholism and alcohol use, which form the basis of many prevention, harm-reduction, intervention, treatment, and relapse-prevention programmes. Although these early models are unitary in nature, they identified factors that are now considered to be integral components of multidimensional biopsychosocial models, such as the public health model and Cox and Klinger's (1988, 2004) motivational model of alcohol use (reviewed in Chapters 2 and 3). Like the public health model, Cox and Klinger's model can be said to include the agent (alcohol), host (person) and environmental factors (if the environment promotes alcohol-use or not, and other life incentives) as determinants of alcohol use, amongst other motivational factors.

Addiction research has come a long way since the early days of Huss and Jellinek. It has evolved to consider drinking to be a multidetermined behaviour that is influenced and mediated by biological, personality, motivational, learning, affective (emotional), cognitive, coping, psychopharmacological and neuropharmacological, environmental, and social factors.

Hester and Miller (1989) and Hester & Sheeby (1990) did not review affective or emotion theories of alcoholism and alcohol use, and this chapter followed suit. Indeed, there is no single model that highlights this component, but a number of key

theories such as the tension-reduction theory (Conger, 1951), stress-response dampening model (Sher & Levenson, 1982), incentive-sensitisation model (Robinson & Berridge, 1993), drinking motives in Cooper's motivational model (1995), and drinking for affective change in Cox and Klinger's motivational model of alcohol use (2004) all considered the importance of the affective variables in alcohol use and misuse. These models and other affective determinants are reviewed in Chapters 2, 4, and 6 of the present thesis. Affective or emotional components increase the utility and predictive strength of biopsychosocial motivational models of alcohol use, because affective or emotional determinants can have a positive or negative impact on prevention, harm-reduction, treatment and relapse-prevention programmes (see Marlatt & Gordon, 1985).

The lack of a unitary model of cognitive influences on alcohol use meant that cognitive and developmental models were not reviewed by Hester and Miller, or Hester and Sheeby, or the present chapter. The interested reader should refer to Adesso (1985) and Sayette (1999) for reviews of cognitive factors in addiction and in the processes of change, and Windle and Davies (1999) for a developmental account. The contributions of different cognitions to alcohol use are considered in the review of Cox and Klinger's model in the following chapters.

Overall, the present thesis takes the view that alcohol use is best explained by the interactions between the personality, motivational, and affective components of Cox and Klinger's motivational model of alcohol use, because it accounts for more of the variations in drinking than singular construct models (e.g., personality or emotion models per se). Investigating the complex interactions between the determinants of alcohol use ought to further the understanding of alcohol use and alcohol-related problems, and benefit the design of prevention, screening, intervention, harm-

reduction, treatment, and relapse-prevention programmes to achieve better outcomes. Given the apparent high costs to the individuals and society that result from alcohol misuse, this is a worthwhile endeavour. The experiments presented in the present thesis had been designed to contribute to this understanding. The next chapter of this thesis reviews Cox and Klinger's motivational model of alcohol use (1988, 2002, 2004) and Gray's Reinforcement Sensitivity Theory (Gray & McNaughton, 2000).

CHAPTER 2

An Overview of the Motivational Model of Alcohol Use and Reinforcement Sensitivity Theory (RST)

Alcohol use and misuse, like other complex human behaviours, are multiply determined (see Finn, 2002; Sher & Trull, 1994). If researchers are to fully understand both the development and maintenance of alcohol use and misuse, they need to develop psychological theories which have multidimensional frameworks. These theories ought to account for the dynamic interaction between personality (McEvoy, Stritzke, French, Lang, & Ketterman, 2004), motivational mechanisms (Cox & Klinger, 1988, 1990, 2002), and affective regulation (Cooper, Frone, Russell, & Mudar, 1995). This approach to the study of alcohol use is superior to the single-construct accounts because it generates more theoretical questions and has better predictive utility. Therefore, a multidimensional framework was adopted for the experimental work reported in this thesis.

This chapter presents an overview of two key theoretical perspectives that seek to explain the multiple factors affecting human behaviour. The first of these, the Motivational Model of Alcohol Use (Cox & Klinger, 1988, 1990, 2004), had been designed to explore the many variables that contribute to the individuals' motivation to drink or not to drink on a particular occasion. This is considered to be a complex and dynamic process. The second theoretical perspective, Reinforcement Sensitivity Theory (Gray, 1970, 1971, 1981, 1982, 1983, 1987; Gray & McNaughton, 2000), had been designed to, more broadly, explore the personality, motivational, and emotional determinants of reward seeking and punishment avoidance behaviours. These theories

are complementary in many respects; the motivational model of alcohol use considers the variables explored in the reinforcement sensitivity theory as being some of the key determinants of the person's decision to drink or not to drink alcohol.

Motivational Model of Alcohol Use

The Motivational Model of Alcohol Use (Cox & Klinger, 1988, 1990, 2004) is considered a biopsychosocial approach because it accounts for the biological, psychological, and sociocultural/environmental influences on alcohol use and misuse. In addition, the model specifies how each component increases or decreases a person's motivation to engage or not to engage in alcohol use on a particular occasion. A brief explanation of the methodological terminology associated with the motivational model of alcohol use is presented first.

Terminology of the Motivational Model of Alcohol Use

One of the finer points of the Cox and Klinger's model of alcohol use is that the final decision to engage or not to engage in alcohol use is considered to be a volitional act. Although the act is volitional, it may be made at an explicit or implicit level. Hence, a person does not need to be fully aware of his or her decision making processes to reach the final decision to consume alcohol or not. What is driving the decision making process is the net expected change in affect that a person expects to gain from engaging or not engaging in alcohol use. If the net expected change is positive, he or she is more likely to engage in alcohol use, whereas if the net expected change is negative, he or she is less likely to engage in alcohol use.

Cox and Klinger claim that drinking for affective change is a fundamental tenet of the motivation to drink. Within the motivational model of alcohol use, affect refers to the emotion(s) a person subjectively experiences. Thus, a person will naturally strive to obtain outcomes that yield positive affective changes, and to avoid, withdraw from, or get rid of outcomes that yield negative affective changes. Classes of stimuli, objects, situations, and goals that can bring about a change in affect become incentives that a person will pursue. Incentive motivation is positively valenced if the stimulus is something that increases positive affect or reduces negative affect, and it is negatively valenced if the stimulus reduces positive affect or increases negative affect. In Cox and Klinger's model people attempt to get, obtain, or accomplish the things that are positively valenced, and to avoid or get rid of the things that are negatively valenced. The subset of incentives that a person is committed to pursuing or achieving is that person's goals or aspirations. During the time between a person becoming committed to pursuing a goal and achieving or disengaging from it, there is a latent brain process termed a current concern. Current concerns correspond to the activities in which people engage in order to achieve their goals. If the goal is to drink alcohol, then drinking becomes the most important current concern—and this goal is pursued vigorously whilst other life goals are neglected.

To summarise, according to the motivational model of alcohol use (Cox & Klinger, 1988, 1990), alcohol use and misuse needs to be viewed in the context of other incentives (goals, desires, and aspirations) people have, and the emotional satisfaction they obtain from these incentives (Cox & Klinger, 2002). For example, if alcohol users and misusers fail to gain emotional satisfaction from other life areas, such as relationships, alcohol itself can become a positive incentive by facilitating desirable changes in affect (Cox & Klinger, 2004).

Components of the Motivational Model of Alcohol Use

Each component of the model that contributes to a person's final decision to engage or not to engage in alcohol use is channelled through a motivational pathway, either distally or proximally. The components of the model can be categorised into: (1) past drinking experiences, (2) current factors, (3) net benefits of drinking, (4) cognitive mediators, (5) net expected change from drinking, and (6) drinking decision. Figure 2.1 shows an abbreviated version of the motivational model of alcohol use; each component of the model is briefly explained next.

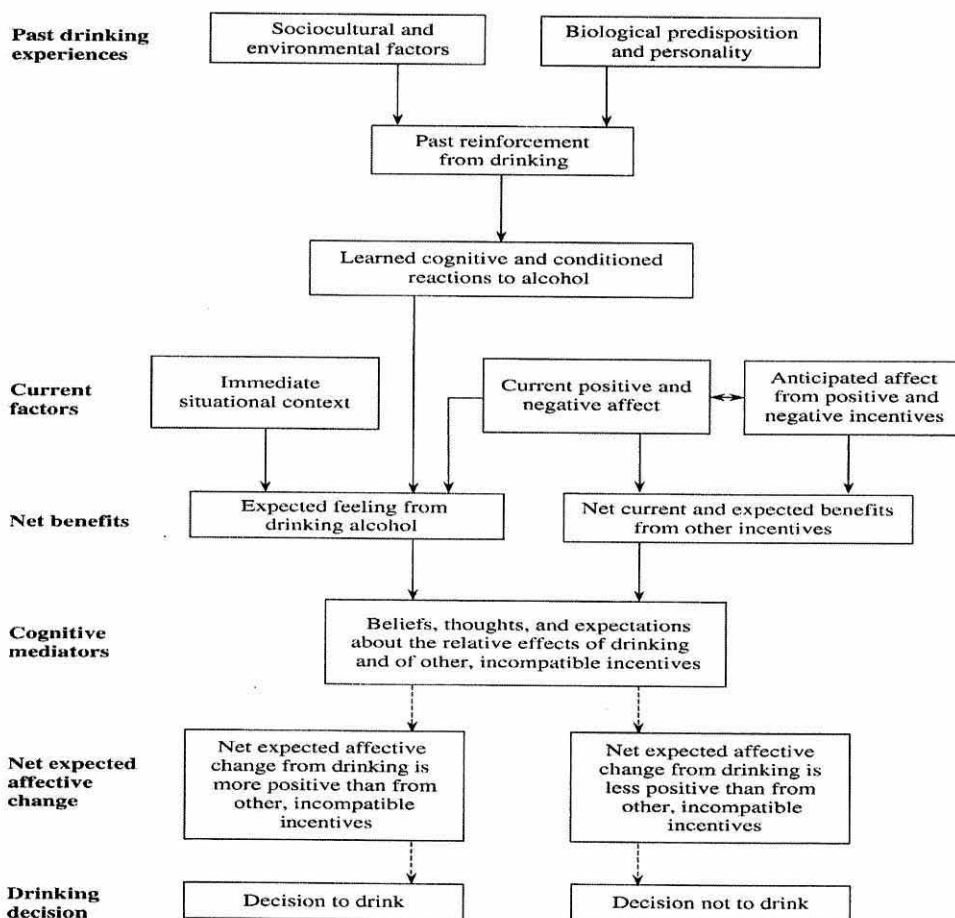


Figure 2.1. An abbreviated version of the Motivational Model of Alcohol Use

(Reproduced from Cox & Klinger, 2004, p.125)

Past Drinking Experiences

Past drinking experiences are distal determinants that influence the final decision to engage or not to engage in alcohol use. They can either promote alcohol use or protect a person from excessive drinking. This level of the model includes sociocultural and environmental factors, biological predispositions, personality factors, and past reinforcement from drinking (positive or negative). All the determinants at this level can influence past drinking experiences and shape how the reinforcement aspects of alcohol drive a person's current expectations of positive or negative consequences from engaging in alcohol use.

Sociocultural and environment factors. These factors are influential in 'wet' cultures, in which alcohol is freely available, and in 'dry' cultures, in which alcohol is prohibited. People from 'wet' cultures consume more alcohol than those from 'dry' cultures (Room 1992, 2001). Some cultures have problems with binge and excessive drinking because they are seen as a cultural norm (e.g., United Kingdom), while other cultures do not have these problems because drinking alcohol is culturally unacceptable (e.g., Qatar). Environmental determinants are salient in the groups (social networks, families, partners, and friends) and situations in which people consume alcohol. People tend to consume levels of alcohol that are comparable to the amount consumed by other members of their social group, and more readily if the social group positively reinforces the level of alcohol consumption. Therefore, people who generally consume small amounts of alcohol tend to be part of a social group that also consumes small amounts of alcohol, and people who tend to consume large amounts of alcohol are found among social groups who also consume large amounts of alcohol. This pattern of drinking probably stabilises over the course of a person's

drinking career as he or she matures, with older people tending to consume less alcohol than younger people (Bennett, McCrady, Johnson, & Pandina, 1999).

Biological predispositions and personality traits. These factors also influence the decision to engage or not to engage in alcohol use. Cox, Yeates, Gilligan, and Hosier (2001) identified personality traits that can predate alcohol problems or co-exist with alcohol misuse. These traits were behavioural disinhibition and negative emotionality. They have also been linked to the development and maintenance of, and subsequent relapse to, alcohol misuse and abuse (Moeller & Dougherty, 2002). These personality traits are further examined below, in the section covering Gray's Reinforcement Sensitivity Theory.

Learned cognitive and conditioned reactions. The factors found to affect alcohol use include a person's alcohol outcome expectancies and motives for drinking. Expectancies can be positive or negative and are defined in lay terms as the beliefs people have about what will happen if they drink alcohol, whereas motives are defined as the values people place on the particular effects they want to achieve from drinking alcohol (Cox & Klinger, 2004, p.124). It is apparent that expectancies and motives can have a direct and indirect effect upon a person's current decision to drink, as well as reinforcing the decision to engage or not to engage in alcohol use. For example, positive expectancies about the effects of drinking tend to be positive predictors of alcohol consumption and negative expectancies about the effects of drinking tend to be negative predictors of alcohol consumption (Lee, Greely, & Oei, 1999). Coping and enhancement alcohol use motives also tend to be positive predictors of alcohol consumption (see Kuntsche, Knibbe, Gmel, & Engels, 2005). Expectancies and motives have also been found to be associated with biological personality predispositions in student samples. Simons and Arens (2007) found that

sensitivity to reward was associated with positive expectancies about marijuana use; Stewart and Devine (2000) found that high neuroticism predicted coping alcohol use motives, whereas high extroversion predicted enhancement alcohol use motives.

Current Factors in Alcohol Use

Expected affective changes and, in turn, decisions that are based on past drinking experiences, can be altered by current factors. Current factors are more proximal determinants of the decision to drink. This level includes determinants such as the physical setting, whether alcohol is present or not, and the degree to which the current situation facilitates the use of alcohol or not. Hence, if a person is in a situation where alcohol is freely available and its use is endorsed, then that person is more likely than not to decide to consume alcohol because of its positive consequences (e.g., enhancing a social gathering—an enhancement alcohol use motive). If that same person is in a situation where the use of alcohol is not endorsed, then he or she is more likely than not to refrain from using alcohol because of its negative consequences (e.g., during an interview or an exam).

Another key issue in the decision to drink is a person's current life situation. The number of incentives that a person has, and the number that are not compatible with alcohol use, are a central tenet of the current factors level. If a person is unable to derive emotional satisfaction from his or her life incentives, then he or she may consume alcohol to regulate emotions (either to maintain or increase positive affect, or to decrease negative affect). So, the expected affective change from engaging or not engaging in alcohol use can be viewed in the context of the emotional satisfaction a person derives from his or her current life situation and the incentives that it yields.

Net Benefits from Drinking and Other Incentives

This component of the model is also a proximal determinant of the decision to drink. There are two determinants: the expected effects from drinking alcohol and the net current and expected benefits from other incentives. The expected effects of drinking alcohol can be felt directly and indirectly. Direct effects are the pharmacological effects of alcohol use, such as the effect alcohol has on neural substrates and neurotransmitters. Thus, a small amount of alcohol may make an anxious person feel calmer by alleviating negative affect. Direct effects may also increase positive affect by enhancing a person's level of optimism. However, the chemical effects of alcohol can also deter alcohol use (e.g., severe headaches in people with low tolerance to alcohol).

Indirect or instrumental effects can occur in four ways, two of which are positive and two of which are negative. Drinking alcohol can have a positive effect on positively valenced incentives, such as being sociable and socialising, and on negatively valenced incentives, like the things a person wants to get rid of, such as pain. Positive effects can enhance a person's motivation to drink. However, drinking alcohol may interfere with other positive incentives, such as by lowering a person's financial status; it can also have a negative effect on negatively valenced incentives, such as worsening a current illness. Negative effects can enhance a person's motivation not to drink. Any direct or indirect effects that are gained from alcohol use tend to be short-lived and have very few benefits.

Cognitive Mediators of Alcohol Use

All distal and proximal determinants discussed thus far give rise, at an implicit or explicit level, to cognitive processes, such as memories, perceptions, and attentional processes. Cognitive processes mediate between the distal and proximal determinants in the motivational pathways and the final decision to drink. The final decision to drink will be strengthened if the person has strong positive but weak negative thoughts about the negative consequences of consuming alcohol, if the person has thoughts about not gaining emotional satisfaction from other positive incentives, or if he or she is troubled by negative incentives (Cox & Klinger, 2004; p.132).

Net Expected Affective Change Resulting from Alcohol Use

Any expected changes in affect from drinking alcohol, or from other life incentives, will vary from person to person; they can also fluctuate in each person over time. The sum of the expected changes in affect terminates in the final decision to drink alcohol or not to do so (the drinking decision). Hence, if the net expected affective change is positive, people will decide to drink, but if the net expected affective change is negative, they will decide not to drink.

Summary of the Motivational Model of Alcohol Use

Cox and Klinger's model of alcohol use defines alcohol use in motivational pathways. A person's transition through these pathways will be influenced by his or her past drinking experiences, current factors, the net benefits to be gained from drinking alcohol, his or her cognitive functioning (e.g., memory networks for alcohol

use), and the net expected affective change from drinking alcohol (positive or negative). Current incentives that are not compatible with alcohol use or are non-alcohol related are also important factors in the decision making processes. If the net expected affective change is positive then the decision will be to drink, but if the net expected affective change is negative then the decision will be to not drink. The distal and proximal effect of each determinant within the component levels of the model may be involved in the final decision-making processes, because they bring about temporal perceived changes in affect from engaging or not engaging in alcohol use.

Reinforcement Sensitivity Theory (RST)

A number of changes had recently been made to the Reinforcement Sensitivity Theory (RST); some of these changes are mentioned in the present review, but the theoretical perspective taken throughout this thesis is from the earlier versions of RST. Other personality and motivation researchers also tend to adhere to the original concepts of RST when investigating addictive behaviours, such as eating disorders and alcohol use (e.g., Hasking, 2006). Likewise, the instrument used to assess Gray's constructs in Studies 1, 2, and 3 of the present thesis was designed on the basis of earlier versions of RST (the sensitivity to punishment and reward questionnaire; Torrubia, Avila, Molto, & Caseras, 2001).

Historical Background to RST

Even today, researchers find it difficult to categorise RST. It cannot be easily assigned to just one area of psychological research. It is sometimes cited as a learning theory, a motivation theory, a personality theory, a developmental theory, an emotion theory, or a neuropsychological theory. What has given RST its broad gamut of classifications are its applications. To understand its applications we need to understand its origins and concepts.

Jeffrey Gray was a neuropsychologist who conducted animal learning experiments with rats to discover the biological basis of anxiety. His research explored the spectrum of anxiety and its dispositions, not its personality dimensions or traits (Smillie, Pickering, & Jackson, 2006). He argued that Hullian drive theory (see Corr, 2008), and Eysenck's arousal theories (see Corr, 2008), did not account for how the behavioural, lesion, and pharmacological findings (using anxiolytic drugs) pointed to two separate mechanisms of punishment and reward.

Gray (1970), in a reconceptualisation of Eysenck's Introversion-Extroversion theory, posited that introverts are more sensitive to punishment and frustrative nonreward (sometimes termed loss of reward) than extroverts. He concluded that neuroticism should be conceptualised as reflecting individual differences in sensitivities to punishment and reward (p. 249). This led him to state that there are stable and heritable individual differences in normal populations that account for behaviour and functioning. Those characteristics are central to a number of current biologically based personality theories that apply to normal and abnormal populations (see Zuckerman 1983, 1994, 1996).

Relationship Between Eysenck's and Gray's Constructs

RST was not a departure from Eysenckian theory (e.g., Eysenck & Eysenck, 1969) but a reconceptualisation of its constructs. Gray rotated his constructs within the Eysenckian factor space delineated by Extroversion (E) and Neuroticism (N). Arguments have arisen about the actual size of the rotation: it was originally quoted as being set at 45° from Eysenck's axes (Gray, 1970, 1981), but modern accounts claim that the original size of the rotation was a misconception and the rotation is actually closer to 30° than 45° (Corr, 2001; Pickering, Corr, & Gray, 1999). Eysenck (1987) reduced the rotation to somewhere between 10° and 15°. The rotations aligned punishment sensitivity with anxiety (Anx) and reward sensitivity with impulsivity (Imp). Figure 2.2 shows the rotations of Gray's constructs within the Eysenckian factor space. Punishment sensitivity runs from stability (Anx-) to neuroticism (Anx+). In a similar manner, reward sensitivity runs from introversion (Imp-) to extroversion (Imp+). A key point to remember is that Eysenck originally aligned impulsivity with extroversion. However, RST holds that Imp+ individuals are most sensitive to signals of reward and that Anx+ individuals are most sensitive to signals of punishment (Corr, 2004).

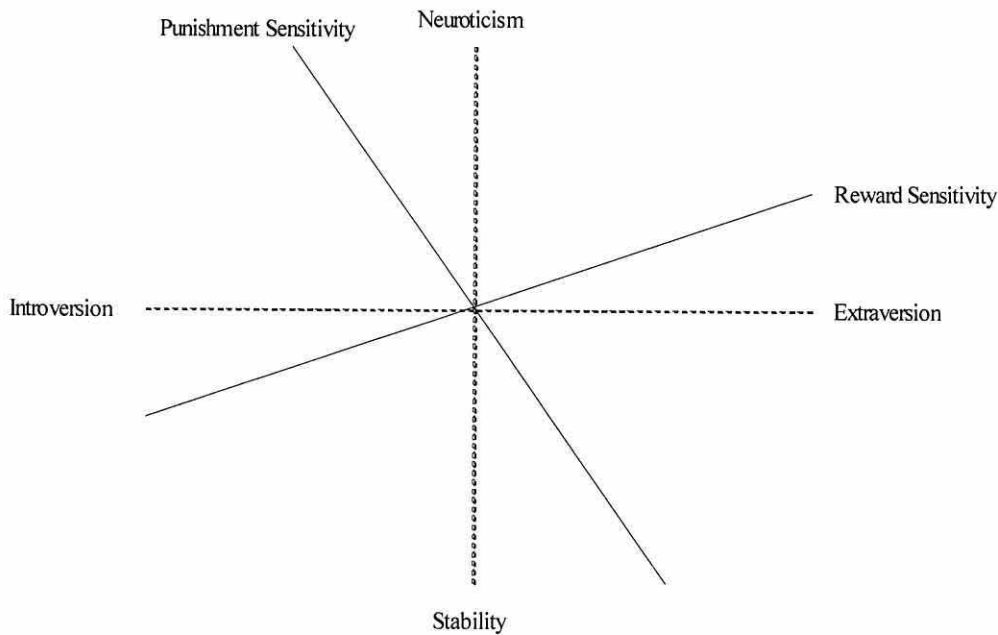


Figure 2.2. The conceptual rotation of Gray's constructs within Eysenckian factor space. The unbroken lines represent Punishment and Reward Sensitivity. Punishment Sensitivity is closer to N and Reward Sensitivity is closer to E in Eysenckian factor space. The dashed lines represent Eysenck's personality dimensions.

Gray proposed that reward sensitivity (Imp) and punishment sensitivity (Anx) are alternatives to E and N, and that the associated personality dimensions are generated by two basic biological systems that control both behaviour and emotion, namely the Behavioural Approach (or Activation) System (BAS) and Behavioural Inhibition System (BIS). Figure 2.3 shows the conceptual locations of Gray's biological systems and personality dimensions within Eysenckian factor space.

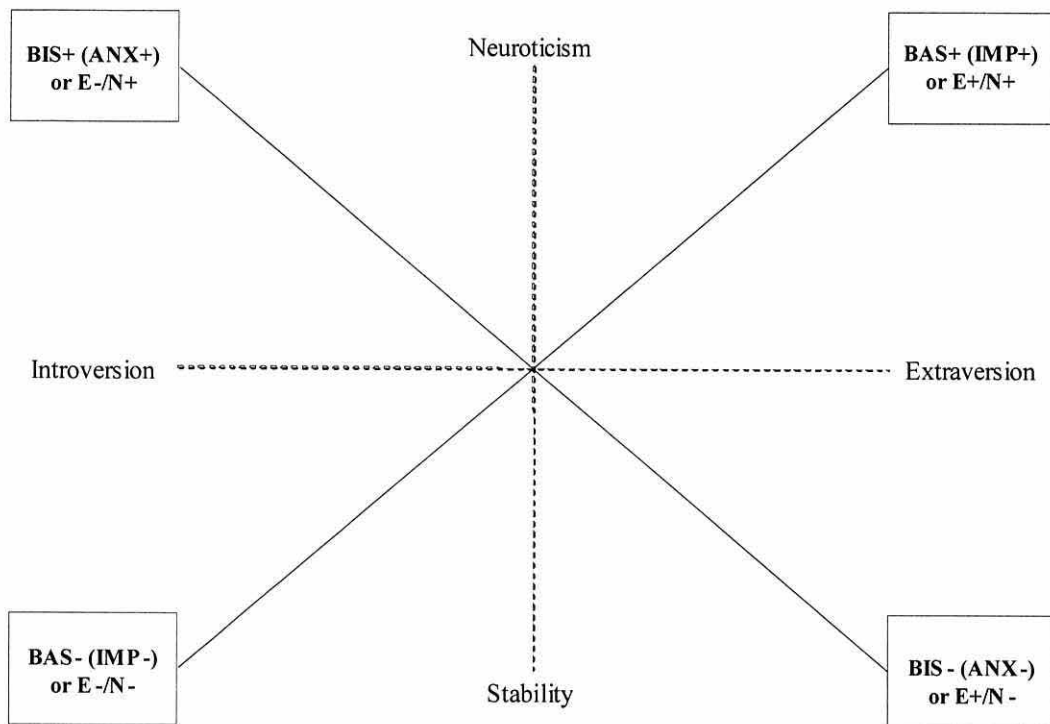


Figure 2.3. The conceptual locations of Gray's biological systems within the Eysenckian factor space alongside the personality dimensions and combinations for E and N. The BAS is sensitive to rewarding stimuli and the BIS is sensitive to punishing stimuli. The full lines represent Gray's constructs and the dashed lines represent Eysenck's personality dimensions. The full lines do not faithfully represent Gray's rotations in Eysenckian factor space but are for illustration purposes only.

In Eysenckian factor space the BAS or reward sensitivities range from E-/N- (Imp-; Imp+) to E+/N+ (Imp+) and the BIS or punishment sensitivities range from E+/N- (Anx-; Anx+) to E-/N+ (Anx+). Individuals with an E+/N+ (Imp+) combination are more sensitive to rewards and more likely to exhibit impulsive

behaviour, whereas individuals with an E-/N+ (Anx+) are more sensitive to punishment and more likely to exhibit anxious behaviours.

Key Components of RST

Gray's theory has undergone a number of key revisions since its conception. Major adjustments were made because some of the research findings were inconsistent with the original tenets of the theory. This is partly due to advancements in neuropsychological techniques for studying the cortical and neural basis of behaviour and psychopathology, and partly due to advances in experimental methodologies for testing the theory (e.g., Transcranial Magnetic Stimulation and Go/No-Go tasks). The revised theory includes a fuller account of Gray's third basic biological system, the Fight-Flight-Freeze System (Corr, 2001, 2002, 2004; Corr & Perkins, 2006; Gray & McNaughton, 2000; McNaughton & Corr, 2004). The individual components of the three-system theory are explained next.

Fight-Flight-Freeze System (FFFS)

The FFFS is responsible for mediating reactions to all innate, or unlearned, aversive stimuli (Corr & Perkins, 2006). It is activated by all conditioned and unconditioned punishment and non-reward stimuli. Activation of the system results in the experience of fear and anger and fight-flight-freeze behaviours, which are defensive behaviours that allow an organism to withdraw from danger (Gray & McNaughton, 2000; McNaughton & Corr, 2004). Flight and freeze are unlearned responses to distal threat stimuli and fight to proximal threat stimuli. The behaviour

performed depends on the defensive distance between the organism and the threat stimuli (McNaughton & Corr, 2004; Smillie et al., 2006).

Anatomically the FFFS is located in the ventromedial hypothalamus and amygdala (one of the masses of grey matter that is part of the limbic system), both of which have been associated with the high level processing of threatening or aversive stimuli (Gray & McNaughton, 2000; McNaughton & Corr, 2004; Pickering & Gray, 2001). The hypothalamus is the control mechanism for the Autonomic Nervous System (ANS) and the Endocrine System (ES). The FFFS is involved in energising defensive behaviours that allow the organism to withdraw from danger (i.e., fleeing). The amygdala is located within the temporal lobes and forms a large part of the limbic system. This structure plays an important role in the modulation of emotional responses to environmental stimuli and the reactions to these stimuli (e.g., defensive behaviours). It also projects to brain areas that are associated with emotional expressions (hypothalamus, pons, midbrain, and medulla). Furthermore, the central nucleus is also associated with emotional responses to aversive stimuli (Gray & McNaughton, 2000; McNaughton & Corr, 2004; Pickering & Gray, 2001). At the behavioural level the FFFS is responsible for escape and avoidance behaviours, and the emotion of fear (Corr, 2004).

The cortical, neural origins and behavioural functions of the FFFS have been fairly well defined in the revised versions of RST. What is still being investigated is its role in personality, motivation, and emotion, but research is starting to identify the disparities between BIS-anxiety and FFFS-fear responses in personality factor space (see Cooper, Perkins, & Corr, 2007). Only through rigorous research and refinements in RST can the role of the FFFS be fully established.

Behavioural Approach System (BAS)

The BAS mediates responses to all innate conditioned or unconditioned reward, non-punishment, and escape from punishment stimuli. It is implicated in the initiation of behaviours that bring the organism closer to the positive reinforcer (Corr, Pickering, & Gray, 1997; Gray & McNaughton, 2000). It is concerned with the experience of reward and facilitates an increase in goal-orientated approach behaviours that monitor the environment for further signals of reward, and result in the pleasurable anticipation of emotional states (e.g., happiness). According to Powell, Gray, Bradley, Kasvikis, Strang, Barratt, and Marks (1991), the pleasurable anticipation of emotional states is like the ‘high’ produced by certain drugs.

The sensitivity of the BAS to rewarding stimuli is postulated to generate the characteristic approach behaviours associated with a number of maladaptive behaviours, such as alcohol use and bulimia nervosa (Kane, Loxton, Staiger, & Dawe, 2004). Individuals who have a heightened sensitivity to reward (BAS+ or SR+) are likely to be more engaged than other individuals (BAS- or SR-) in the pursuit and attainment of rewarding stimuli and sensations (Corr, 2001, 2002, 2004; Corr & Perkins, 2006).

Impulsivity is the personality trait most associated with BAS functioning, especially dysregulated functioning (BAS+ or SR+). Impulsivity has traditionally been described as the inability to deliberate before initiating behaviour (Dickman, 1990), but this type of definition is now considered to be too narrow. Thus Moeller and Dougherty (2002, p. 3) give a broader definition of impulsivity, based on biological and psychological studies, as, “the predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to themselves or others”. Three core issues are addressed in Moeller

and Dougherty's definition. First, impulsivity is separated from other aspects of executive cognitive functioning. Second, impulsivity is seen as a relatively stable personality trait, which can fluctuate from time to time. Third, impulsivity is separated from poor judgement making, because rapid and unplanned reaction components are incorporated into the definition. Moeller and Dougherty state that some impulsive judgments may be ill advised even though the actions have been thought through in advance.

In the revised versions of RST, BAS personality dimensions are said to be characterised by optimism, reward-orientations, and impulsivity (e.g., dysfunctional impulsivity and rash-impulsiveness). Current motivational theories of BAS activity propose that variations in Gray's reward system are more associated with extroversion than previously believed. Extroversion is now defined in terms of reward-motivation rather than in terms of general arousal (Depue & Collins, 1999; Corr, 2004; Smillie et al., 2006). A full address of the differences and similarities between impulsivity, extroversion, and reward sensitivity is beyond the scope of this thesis (see Revelle, 1997, for a review). More pertinently, BAS impulsivity characteristics are believed to be associated with a number of addictive behaviours (e.g., pathological gambling, alcohol use, drug use, and eating disorders) and the appetitive aspects of hypomania (Corr & Perkins, 2006).

The BAS is located within the mesolimbic and mesocortical systems of the brain (Gray, 1987; Gray & McNaughton, 2000; Pickering & Gray, 2001). Cell bodies of neurons in the mesolimbic system are situated in the ventral tegmental area and project axons to the limbic system, which includes the nucleus accumbens, amygdala, and hippocampus. The nucleus accumbens is found at the junction between the limbic system and the striatum; it has a role in the initiation and regulation of emotions, and

is involved in the positive reinforcing effects of drugs of abuse, such as alcohol. Gray and McNaughton (2000) emphasised that the dopaminergic pathways form the neural substrate for the BAS. Dopamine is a neurotransmitter and modulator that is usually associated with the brain's reward (or approach) pathways and the reinforcing effects of alcohol (Kapusta, Plener, Schmid, Thau, Walter, and Lesch, 2007; Spanagel & Weiss, 1999; Wise 1998).

Electrophysiological studies have found associations between self-report measures and electroencephalogram (EEG) measures of BAS activity (Coan & Allen, 2003; Harmon-Jones & Allen, 1997; Sutton & Davidson, 1997). This activity is located in the left-prefrontal cortex, which is in turn involved in motivation, processing of affect, and emotional regulation (e.g., lifting moods) to some degree (see Davidson, 2004). The left-prefrontal cortex may play an important role in inhibiting the activity of the amygdala and dampening responses to negative events, particularly in quickly extinguishing negative responses once they have been activated. The extinguishing of negative emotions is considered to be an adaptive process and is something that individuals who show this pattern of left-sided brain activity do well (Davidson, 1998).

To conclude. The BAS has frequently been discussed in the literature as the system for reward sensitivity and impulsivity. However, many RST researchers no longer consider impulsivity to be a homogeneous construct. In the current literature, impulsivity is discussed in terms of reward drive and rash impulsiveness (see Dawe, Loxton, Gullo, Staiger, Kambouropoulos, Perdon, & Wood, 2007), impulsive antisocial sensation-seeking (ImpASS; Pickering, 2004), and in terms of its functional and dysfunctional components (Smillie & Jackson, 2006). Therefore, in the experimental chapters of this thesis, the behavioural term sensitivity to reward (SR) is

employed instead of the trait term impulsivity, because this avoids the ambiguities associated with the multi-trait definitions of impulsivity. This use is in line with Corr (2004), who stated that the SR component of the sensitivity to punishment and reward questionnaire reflects BAS functioning.

Behavioural Inhibition System (BIS)

In the early versions of RST, the BIS was defined as being sensitive to punishment signals, nonrewards, dislike of novelty, and the rapid withdrawal from danger (this point became associated with the FFFS, and not the BIS, in the revised versions of RST); it is an anxiety-based response system. The BIS was said to inhibit movement toward goals that result in negative outcomes.

In the revised version, the BIS is said to be involved in the resolution of all goal conflicts (Corr & Perkins, 2006). Goal conflicts tend to occur during BAS-FFFS (approach-avoidance) conflicts, but they can also occur during BAS-BAS (approach-approach) and FFFS-FFFS (avoidance-avoidance) conflicts. Approach-avoidance conflicts are generally associated with anxiety and anxiety-related behaviours. During simple approach-avoidance conflicts, avoidance will be favoured over approach. Approach-approach conflicts tend to result in frustration because a loss is incurred after making a wrong decision or choice. Avoidance-avoidance conflicts tend to cause anxiety and anxiety-related behaviours that are similar to those experienced during approach-avoidance conflicts, because the same system is activated (Corr & Perkins, 2006).

When an organism is exposed to punishing or rewarding stimuli, avoidance or approach behaviours may not always result. The FFFS will be mediated by the concurrent approach tendencies (BAS activation). Activation of the BAS is mediated

by the concurrent avoidance tendencies (FFFS activation). The BIS mediates between the FFFS-avoidance tendencies and the BAS-approach tendencies by inhibiting behaviour so the conflict can be resolved. Figure 2.4 shows the relationship between the three systems during an approach-avoidance conflict.

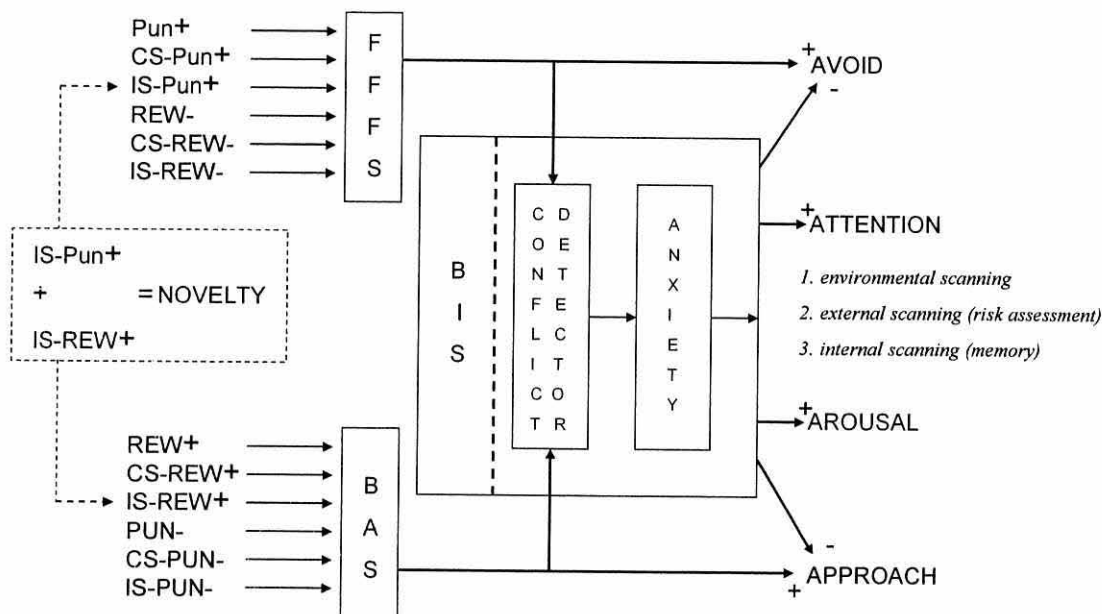


Figure 2.4. The relationship between the Fight-Flight-Freeze (FFFS), Behavioural Approach (BAS), and Behavioural Inhibition (BIS) systems during an approach-avoidance conflict. Also shown are the effects of Punishment Stimuli (Pun), Conditioned Stimuli (CS), Innate Stimuli (IS), Reward Stimuli (REW), and their valences (+/-).

As can be seen in Figure 2.4, when the FFFS and BAS are activated simultaneously during approach-avoidance goal conflicts, the BIS generates emotions associated with danger; it may be functioning as an alerting system. By generating

watch-out emotions, the BIS: (1) attempts to inhibit concurrent conflicting behaviours, (2) initiates risk-assessment behaviours, and (3) scans the memory and environment for ways to resolve the goal conflict (Corr & Perkins, 2006). The BIS takes a defensive approach that differs from that taken by the FFFS, which attempts to remove the organism from a dangerous situation. The BIS processes information so it can make an informed decision on the right course of action to take in order to terminate the anxiety state. These actions are adaptive BIS functions (McNaughton & Corr, 2004).

The BIS resolves goal-conflicts by increasing the negative valence of stimuli in recursive loops until they become sufficiently strong inputs for the FFFS or BAS (Corr, 2001, 2002, 2004). This process continues until either an avoidance or approach behavioural resolution is made, because stimuli have to become positively valenced before they can activate avoidance or approach behaviours. While the BIS attempts to resolve goal conflicts, the organism tends to experience negative emotional states, such as worry and rumination. The high BIS personality type (BIS+) tends to be marked by worry-proneness and anxiety; at its extreme, these individuals tend to be constantly on the look out for signs of danger. This hypervigilance may lead to Generalised Anxiety Disorders (GAD) and Obsessive-Compulsive Disorders (OCD); both have been associated with poor environmental goal resolutions (Corr & Perkins, 2006).

Some of the characteristics associated with the BIS+ personality type are in line with Eysenck's hypervigilance theory (1987). This theory attempts to explain the attentional functioning of anxious individuals. The theory states that anxious individuals have a greater tendency to continually scan the environment for threatening or dangerous stimuli than non-anxious individuals (Mathews, May, Moog,

& Eysenck 1990). This continual scanning of the environment by anxious individuals for dangerous, threatening, and aversive stimuli may lead to a greater distractibility by peripheral stimuli and the inability to maintain attentional focus on centrally-cued stimuli (Shapiro & Lim, 1989). Attentional studies have found that anxiety, BIS, and sensitivity to punishment (SP) scores are related to difficulties in disengaging from peripheral cues during cued reaction time paradigms (see Avila & Parcet, 2002; Derryberry & Reed, 1994; Poy, Eixarch, & Avila, 2004). Hypervigilance is a key characteristic in cognitive-motivational theories of phobias (e.g., spider phobias), which are marked by a hypervigilance–avoidance pattern of anxiety disorder (Pflugshaupt, Mosimann, vonWartburg, Schmitt, Nyffeler, & Muri, 2005).

The cortical and neural basis of the BIS is the septo-hippocampal system, the orbitofrontal cortex, and the ascending noradrenergic and serotonergic pathways in the forebrain. Memory formation, information processing, and self-regulation behaviours are the main roles of the hippocampus (Gray & McNaughton, 2000; Pickering & Gray, 2001). The action of these brain systems is influenced by the inhibitory neurotransmitter gamma-aminobutyric acid (GABA).

Electrophysiological studies have found associations between self-report measures and EEG measures of BIS activity (Coan & Allen, 2003; Harmon-Jones & Allen, 1997; Sutton & Davidson, 1997), occurring in the right-prefrontal cortex, which in turn is involved in self-regulation, self-control, and behavioural adjustments to environmental stimuli. Furthermore, it is involved in the executive control of self-interested impulses by modulating the impact of fairness motives and self-interest

motives on decision making.¹ This process weakens the impact of self-interest motives (the desire to obtain a risky reward) on decision making. Lesion studies have found that the right hemisphere is involved in the processing of emotional and social information (Knoch & Fehr, 2007).

To conclude. The BIS has frequently been discussed in the literature as the system underlying anxiety because it is activated by signals of punishment, novel stimuli, and innate fear producing stimuli.² However, in the contemporary revised theory, the BIS is said to be characterised by two distinct personality dimensions, worry-proneness and anxiety (Corr & Perkins, 2006). Therefore, in the experimental chapters of this thesis, the behavioural term sensitivity to punishment (SP) is employed instead of the trait term anxiety, because this avoids the ambiguities associated with the multi-trait definitions of the latter term. The present use is also in line with that of Corr (2004), who stated that the SP component of the sensitivity to punishment and reward questionnaire reflects the combined functions of the FFFS and BIS.

¹ Fairness and self-interest motives form part of high level cognitive decision-making processes; they enable an individual to control maladaptive self-rewarding behaviours by resisting temptation and urges.

² Innate fear stimuli are those stimuli that can be identified as potentially threatening without previous experience. Organisms display responses to these stimuli without any specific learning, training, or reinforcement; they are responding instinctively.

Separable and Joint Subsystems Approach to RST

Originally, Gray's theory stated that the BAS and BIS systems are orthogonal; this view had since been challenged. The original, separable subsystems approach to RST assumes that: (1) responses to reward are the same at all levels of anxiety, and (2) responses to punishment are the same at all levels of impulsivity. The findings from research studies have been inconsistent when testing the separable subsystems approach; sometimes they support it and sometimes they do not (see Pickering, Corr, Powell, Kumari, Thornton, & Gray, 1997, for a summary). As a result, Corr (2002, p. 514) concluded that the BIS and BAS jointly influence reward and punishment-mediated behaviour and responses.

In the revised RST, the BIS is said to be activated only when there is concurrent activation of the BAS. According to Corr (2001, 2002, 2004), impulsive individuals (BAS+ or SR+) should be more sensitive to signals of reward than non-impulsive individuals (BAS- or SR-), and anxious individuals (BIS+ or SP+) should be more sensitive to signals of punishment than nonanxious individuals (BIS- or SP-). The joint subsystems approach postulates that the BIS and BAS exert two effects on behavioural responses, namely facilitatory and antagonistic. During facilitatory effects the BIS mediates responses to all aversive stimuli, and the BAS mediates responses to all appetitive stimuli. During antagonistic effects the BIS and BAS impair the responses that are mediated by the other reinforcement system (Corr, 2001, 2002, 2004). Thus, during BIS behaviours Anx+ facilitates behaviour and Imp+ antagonises behaviour and during BAS behaviours Imp+ facilitates behaviour and Anx+ antagonises behaviour. The exact pattern of personality effects depends upon the relative strength of the aversive (BIS activation) and appetitive (BAS activation) stimuli (Corr, 2002; p. 515). Further, with weak aversive and appetitive stimuli,

antagonistic effects are more likely to occur when Anx impairs BAS-mediated behaviour. Similarly, with strong stimuli, facilitatory effects are more likely to occur when Anx facilitates BIS-mediated behaviour and Imp facilitates BAS-mediated behaviour (Corr, 2001, 2002, 2004).

A key factor in research, which may determine whether the data are consistent with the separable subsystems account or with the joint subsystems account of RST, is the value of Anx and Imp. Corr (2001, 2002, 2004) stated that, if extreme personality types are tested, the results will support the separable subsystems approach; this is because the value of the appetitive and aversive stimuli would be amplified in these personality types. Amplification of appetitive and aversive stimuli would occur because one system would inhibit the other system and produce main effects for anxiety or impulsivity. By contrast, if the study sample consists of individuals who do not exhibit these extreme personality types, these effects will not be observed, and the results will favour the joint systems account of RST.

The mechanism underlying the behavioural effects of the joint subsystems approach is the same as in the Arousal-Decision model of reward and punishment (Corr, 2001, 2002, 2004; Gray & Smith, 1969). This model assigns roles to reward and punishment comparators, which compare actual and expected reinforcement because people have unique expectancies regarding the relative strength of rewarding and punishing stimuli. Only rewards that are equal to or greater than expected rewards will activate the BAS, and only punishers that are equal to or greater than expected punishers will activate the BIS (Corr, 2002). Any punishment that is lower than the expected punishment can activate the BAS and results in appetitively motivated actions (i.e., relief of nonpunishment; the failure to be punished becomes rewarding). In a similar manner, any reward that is lower than the expected reward can activate

the BIS and results in aversively motivated actions (i.e., frustrative nonreward).³

Thus, according to Corr (2001, 2002, 2004), frustrative nonreward is mediated by the BIS and not the BAS.

Summary of Reinforcement Sensitivity Theory

Although Gray's theory is difficult to categorise, it is probably best described as a personality theory that comprises three biological systems of emotion which underlie motivated behaviour (Corr, 2002). Pickering and Gray (2001, p.115) described RST as a classification of fundamental human personality traits in terms of individual differences in the responsivity of basic brain and behavioural systems that respond to all reinforcing stimuli. The revised RST emphasises the role of three biological systems that respond to all internal and external stimuli.

First, the BAS is the system responsible for reward sensitive and impulsive behaviour; it mediates responses to all innate, conditioned and unconditioned appetitive stimuli. Dopamine plays a key role in the functions and behavioural outputs of this system, which is also associated with the pleasurable anticipation of positive emotions and left-sided prefrontal cortex functioning.

Second, the BIS is the system responsible for punishment sensitive behaviour, anxiety, and for inhibiting/resolving goal-conflicts; it is also associated with worry-proneness and rumination, and the sense of danger and loss. GABA plays a key role in the functions and behavioural outputs of this system, which is also associated with

³ Frustrative nonreward occurs when perceived reward is lower than expected reward and results in frustration, disappointment, and negative emotional states because the level of reward is perceived as a loss or punishing.

negative emotions, self-regulation behaviours (inhibiting impulses), and right-sided prefrontal cortex functioning.

Third, the FFFS is the system responsible for avoidance and escape behaviours; it mediates responses to all innate, conditioned and unconditioned aversive stimuli and generates fear emotions. Flight and freeze are unlearned responses to distal threat stimuli and fight to proximal threat stimuli; the behaviour performed depends on the defensive distance between the organism and the threat stimuli. No neurotransmitter has been proposed as specific to this system's functioning. The FFFS does not mediate Anx because that role is performed by the BIS.

The BIS mediates between FFFS-avoidance and BAS-approach tendencies to resolve goal-conflicts. BIS and BAS can have facilitatory or antagonistic effects on each other depending on the relative strength of the aversive and appetitive stimuli. Individuals will react differently to Anx and Imp stimuli because they have individual differences in singular or combined BIS and BAS sensitivities (according to separable and joint subsystems hypotheses and arousal-decision model). Differences in BAS and BIS responsivity to rewarding and punishment stimuli occur at the inter-individual level. If punishment is less than expected it can result in appetitively motivated relief from nonpunishment behaviours and if reward is less than expected it can lead to aversively motivated frustrative nonreward behaviours.

Summary and Conclusions

Cox and Klinger's motivational model of alcohol use provides a useful multidimensional framework within which the contributions of situational, learning, personality, cognitive, emotional, and other variables can be explored in relation to alcohol use and misuse. The structure and key concepts of the motivational model of alcohol use were presented in this chapter; several different aspects of the model and the associated research findings are reviewed in later chapters. Thus motivational structure, alcohol use motives and motives for abstaining from alcohol, and the net expected gain from alcohol consumption, are discussed in Chapter 4 to introduce a study which explored the relationship between these variables and alcohol use. Likewise, the concepts from the motivational model relating to alcohol reinforcement (negative and positive) and emotion variables are reviewed in Chapter 6 to introduce the final study in this thesis.

The present chapter highlighted some of the salient theoretical and empirical findings from a large body of work on RST: the concepts derived from Gray's theory have been tested in research on personality, emotion, motivation (including goal-directed behaviours and general well-being), neuropsychology, child development, psychological disorders (e.g., anxiety, phobias, depression, and hypomania), cognitive psychology, and addictive behaviours. The present review pointed to the apparent relevance of some of Gray's concepts, namely BAS activation and sensitivity to reward (SR) and BIS activation and sensitivity to punishment (SP), to the study of determinants of alcohol use and misuse. The relevant findings from RST are next reviewed in Chapter 4 with reference to coping, control beliefs, and goal setting, and in Chapter 6 with reference to emotion, alcohol reinforcement, and mood induction.

The motivational model of alcohol use has already generated a large body of research into the determinants of alcohol or substance abuse among diverse populations (Cox, Crowe, & Singh, 1996; Cox, Hosier, Crossley, Kendall, Roberts, 2006; Parry-Jones, Vaughan, & Cox, 2006; Sellen, McMurrin, Cox, Theodosi, Klinger, 2006); it has been used as a theoretical basis of several effective interventions aimed to reduce alcohol consumption (Cox & Klinger, 2004; Fadardi & Cox, 2007; Hogan, 2005). Working within the general framework of Cox and Klinger's model, the past studies explored the effects of cognitive determinants of alcohol use, including Addiction-Stroop test and alcohol attentional bias (Cox, Fadardi, & Pothos, 2006; Cox, Hogan, Kristian, & Race, 2002; Fadardi & Cox, 2006). Integrating theoretical and empirical findings from other research areas into the motivational model of alcohol use extended the predictive ability, validity, reliability, and utility of the model.

The experimental work reported in this thesis was designed to further contribute to this body of research by exploring the utility of RST with respect to personality, motivation, and emotion variables, and their relationship to alcohol use in students.

CHAPTER 3

Study 1:

Personality Correlates of Students' Drinking

This chapter presents the first correlational study in this thesis. Study 1 was designed to explore the relationship between RST personality measures and drinking in a sample of students. To introduce this study, an overview of past personality research is presented first, followed by a brief review of the past research which employed RST personality measures in the study of addiction.

Historical Personality Research in Addictive Behaviours

The investigation of personality factors within addictive behaviours research has a long and complex history. According to Mulder (2002), much of the research attempted to determine whether alcoholics have different personality traits than non-alcoholics. This question has historical roots. In the 1930s and 1940s, psychologists sought to identify the “alcoholic personality”, and a number of personality traits were proposed (e.g., neuroticism, narcissism, latent homosexuality, escapism, and avoidance; Barbara, 1945).¹ Miller and Kurtz (1994, p. 2) defined an alcoholic personality as the idea that alcoholics share a common set of undesirable personality traits that somehow precede, worsen, or continue with the development of drinking problems.

¹ For a fuller discussion of the alcoholic personality, refer to Cox (1979).

In the 1950s and 1960s, the literature was not able to provide any consistent evidence for an alcoholic personality type (Mulder, 2002). Traits such as delinquency, the inability to tolerate frustration, uncontrolled disinhibited behaviour, impulsivity, rebelliousness, hostility, and antisocial tendencies were identified among alcoholics (Cowan, Auld, & Begin, 1974). Lisansky (1967) concluded that research had not yielded evidence for an alcoholic personality, although personality plays an important part in predicting who will develop alcoholism and who will not.

Research in the 1960s and 1970s moved the focus on to personality traits that predispose individuals to alcoholism and alcohol misuse (e.g., neuroticism, extroversion, and psychoticism). By the 1980s personality-based accounts of substance misuse again became prominent because of the increase in polydrug use and dependence in the 1960s and 1970s (Mulder, 2002). Personality differences between polydrug users and those who did not use more than one drug were considered an important factor in treatment programmes. Polydrug users tended to be younger, more impulsive, disinhibited (undercontrolled), and extroverted, and they tended to have worse treatment outcomes than alcoholics. Additionally, genetic and heritable characteristics of personality gained prominence because it was believed that: (1) genetics accounted for individual differences in alcohol related behaviours, and (2) personality might mediate the genetic effects of alcoholism (Mulder, 2002, p.45).²

More recently, it has been accepted that there is no such thing as a pure alcoholic personality type, but a number of core personality traits may predispose an

² For a fuller discussion of the associations between genetics, personality, and alcohol use refer to Cloninger, Sigvardsson, and Bohman (1988).

individual to alcohol misuse and possible dependence. These traits are sometimes referred to as a prealcoholic personality type or an addiction-prone personality, as proposed by Barnes (1983, 2000). A prealcoholic personality comprises traits that may predispose an individual to become an alcoholic and that do not occur as a consequence of the disorder (e.g., sensation seeking and reward sensitivity). This definition is similar to Lisansky's (1960) criteria for defining a prealcoholic personality. Lisansky argued that the scores for alcoholics and non-alcoholics on personality tests must be discriminated by an unambiguous pattern of personality traits that are not present in other clinical populations. This definition was proposed before the growth in co-morbidity studies within addictive behaviours research. Thus, some of the personality traits associated with a prealcoholic personality can also be found amongst conduct disorders, hyperactive-impulsive syndromes, and other externalising disorders (e.g., dysregulated BAS, high reward sensitivity, sensation seeking, and impulsivity). Moreover, the term prealcoholic can be traced to Jellinek's alcoholic stages (Jellinek, 1960); in this model, a prealcoholic is a social drinker who begins drinking alcohol to reduce stress.

A longitudinal study that investigated the relationships between personality and alcohol use and abuse in a large general population (Barnes, Murray, Patton, Bentler, & Anderson, 2000) identified that an addiction prone personality is characterised by one of two distinct pathways to alcohol consumption and alcohol related problems: (1) a stimulus reducing/sensation seeking pathway, and (2) a psychoticism/antisocial personality pathway. The stimulus reducing/sensation seeking pathway is proposed to mediate alcohol-related problems through alcohol consumption, whereas the psychoticism/antisocial pathway predicts alcohol-related problems more directly (McGregor, Murray, & Barnes, 2003).

From the brief overview of alcoholic, prealcoholic, and addiction prone personalities, it is clear that there is no pure alcohol misusing personality type (Cox, 1979), but that a core number of personality traits may predispose a person to engage in risky drinking behaviours and lead to the subsequent development of alcohol dependence (e.g., impulsivity, sensation seeking, reward dependence, anxiety, and neuroticism or negative emotionality). Current research in addictive behaviours tends to focus on these “negative” personality traits because they are the best indicators (or predictors) of alcohol use and abuse in student, community, and clinical populations. Negative personality traits are considered to be more distal predictors of alcohol use that operate through more proximal predictors of alcohol use (e.g., drinking motives mediate the association between personality and alcohol use in Cox & Klinger’s motivational model of alcohol use). Thus, personality traits can be envisaged as forming part of a motivational pathway to alcohol use and alcohol related problems (e.g., as past drinking experiences in Cox & Klinger’s model, reviewed in Chapter 2).

A myriad of personality traits and models have been tested in addictive behaviours research; these include Eysenck’s Introversion-Extroversion and P-E-N models, Gray’s Reinforcement Sensitivity Theory, Cloninger’s Temperament Model, Costa and McCrae’s Big Five, Zuckerman’s Sensation Seeking Model, Dickman’s Functional and Dysfunctional Impulsivity Model, and Whiteside and Lynam’s UPPS model. A full account of these models and findings is beyond the scope of this thesis. Only the models that have been previously found to be associated with the motivational model of alcohol use (see Hosier, 2001; Hogan, 2005), and those that have relevance to the application of RST, are discussed.

The use of RST Constructs in Addictive Behaviours Research

The following three sections of the introduction: (1) specify how RST personality dimensions have been assessed in addictive behaviours research, (2) give a brief overview of the Reward Drive-Rash Impulsiveness model that was derived from Gray's account of the BAS, and (3) present the findings from RST studies in addictive behaviours research.

BIS and BAS Sensitivity

The relationships between BIS and BAS sensitivity and addictive behaviours (e.g., alcohol use, smoking, drug abuse, polydrug use, and eating disorders) have been recently investigated in student, community, and clinical samples, and in a combination of these samples, in cross-sectional and experimental studies. Cross-sectional studies have tended to use one of three self-report measures to assess BIS and BAS sensitivities: (1) Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia et al., 2001), (2) BIS/BAS Scale (Carver & White, 1994), or (3) Gray-Wilson Personality Questionnaire (GWPQ; Wilson, Barrett, & Gray, 1989, 1990). Carver and White's scales that measure BAS sensitivity (reward responsiveness, drive, and fun seeking) capture more of Extroversion (E), and the BAS component of the GWPQ captures more of Psychoticism (P). The GWPQ BAS component may have been designed to capture more of P because Eysenck relocated impulsivity with P and not with E in the Eysenck Personality Questionnaire (EPQ;

Eysenck & Eysenck, 1975).³ The distinction between impulsivity and BAS sensitivity was further clarified by Corr (2002); he stated that impulsivity is related to reward expectancies and not BAS sensitivity per se, and argued that behavioural impulsivity is related to an intolerance for delayed reward and a high rate of temporal discounting (e.g., choosing between an immediate and a delayed reward). Impulsivity and behavioural impulsivity have been associated with negative emotional states like aggression and violence in some pathological disorders (e.g., Conduct and Attention-Deficit/Hyperactivity Disorder or ADHD; Hundt, Kimbrel, Mitchell, & Nelson-Gray, 2008).

Experimental research has employed cue-exposure reactivity paradigms, the Q-TASK, the Card Arranging Reward Responsivity Objective Task (CARROT), or a combination of these paradigms. The Q-TASK is a measure of BIS punishment responsivity and the CARROT is a measure of BAS reward responsivity.

Reward Drive and Rash Impulsiveness

As stated in Chapter 2, impulsivity is no longer considered to be an homogeneous construct among RST researchers, but consists of two related dimensions: (1) Reward Drive, and (2) Rash Impulsivity (e.g., Dawe & Loxton, 2004; Dawe et al., 2007; Franken & Muris, 2006; Loxton, Wan, Ho, Cheung, Tam, Leung, & Stadlin, 2008). Reward drive is associated with motivating factors that drive the decision to engage in substance use. The motivating factors that predict the

³ Corr (2001) provided formulas for deriving BIS and BAS scores from the EPQ-R. BIS: $(\text{Anxiety} = (21 - E) + (N \times 2) - P)$ and BAS: $(\text{Impulsivity} = (E \times 2) + N + P)$. These formulas tend to yield moderate correlations between the SPSRQ scale scores and the BIS and BAS EPQ-R derived scores.

continuation of substance use (e.g., drinking motives, reinforcement from drinking, and alcohol expectancies) are similar to the tenets and determinants of Cox and Klinger's motivational model of alcohol use, reviewed in Chapter 2.

Rash impulsiveness is associated with drug use, the inability to inhibit or stop drug use once an approach response has been commenced, and disregard for the negative consequences of drug using behaviours (Dawe et al., 2007; Dawe et al., 2008; Dawe, Gullo, & Loxton, 2004; Dawe & Loxton, 2004). Furthermore, rash impulsiveness is associated with disinhibited behaviours and cognitive factors (e.g., poor decision making), in that it reflects the tendency to act without deliberation and the inability to resist urges (Dawe et al., 2007, p. 5). Reward Drive can be assessed with the Sensitivity to Reward scale of the SPSRQ, or Reward Responsiveness and Drive scales of the BIS/BAS scales, while Rash Impulsivity can be assessed with the Eysenck Impulsivity scale, Barrett Impulsiveness Scale (BIS), Zuckerman Sensation Seeking Scale (SSS), and Cloninger Novelty-Seeking scale (Dawe & Loxton, 2004).

A key point in Gray's theory and the Reward Drive-Rash Impulsiveness model is that dopamine plays an important role in naturally rewarding and substance use behaviours. The mesolimbic dopaminergic circuits in the brain are sometimes termed the "Reward Pathways" because the release of dopamine in these pathways is associated with positive affect and motivated approach behaviour (Ashby, Isen, & Turken, 1999). These pathways can be activated by healthy incentives like food, water, and sex, but can also be activated by unhealthy incentives like substances of abuse, such as chocolate, nicotine, alcohol, and drugs (when the reward pathways become dysregulated). Hence, reward-sensitive individuals (BAS+, SR+, Reward-Drive+) show greater dopamine activation in the mesolimbic dopaminergic circuits and have a greater positive responsivity to rewarding cues. Such people experience

higher levels of positive affect and pay greater attention to these rewards (Dawe et al., 2007).

The Reward Drive and Rash-Impulsiveness model has been associated with the initiation, development, and maintenance of substance misuse behaviours (e.g., risk taking behaviours in younger people). The advocates of this model propose that an understanding of the constituent traits of impulsivity, and the role each trait plays in substance misuse behaviours, is vital for developing adequate interventions and treatment programmes. They conclude that intervention and treatment programmes should address personality and motivational factors of substance misuse, a point supported by Conrod, Stewart, Pihl, Cote, Fontaine, and Dongier (2000), Project MATCH (1998), and Staiger, Kambouropoulos, and Dawe (2007).⁴

Findings from RST Studies in Addictive Behaviours Research

Only a few articles reporting the associations between RST personality constructs, alcohol use, drug use, and substance misuse were published before 2005, the time when Study 1 of this thesis was designed and completed. This research is reported here, and a tabulated summary of the relevant papers can be found in Appendix 1 (Table 1.1.). The review of the research that appeared in publications after Study 1 had been completed is presented in the Discussion section of this chapter.

Brunelle and colleagues assessed the heart rate responses of 37 participants after they consumed a priming dose of alcohol (Brunelle, Assaad, Barrett, Avila,

⁴ For a fuller discussion of the Reward Drive-Rash Impulsiveness model and its importance in the design of interventions and treatment programmes refer to Dawe et al. (2007, p.13).

Conrod, Tremblay, & Pihl, 2004). They found that high heart-rate responders scored higher on sensitivity to reward than low heart-rate responders, and that participants' use of stimulant drugs was associated with higher scores on an alternative measure of impulsivity. In other studies that have used the BIS/BAS or SPSRQ scales, BAS responsivity scores have been found to be positively associated with: (1) higher scores on the AUDIT, (2) positive urges to drink in a cue-reactivity paradigm, (3) a lifetime diagnosis for drug or alcohol dependence, (4) lower ratings for subjective well-being, (5) alcohol misuse, and (6) positive and negative reinforcement alcohol motivations (Franken, 2002; Johnson, Turner, & Iwata, 2003; Jorm, Christensen, Henderson, Jacomb, Korten, & Rodgers, 1999; Kambouropoulos & Staiger, 2004; Knyazev, Slobodskaya, Kharchenko, & Wilson, 2004; Loxton & Dawe, 2001). These findings show that BAS measures can be used to assess the determinants of alcohol use in normal and clinical populations.

The findings for BIS measures within addiction literature are not as strong as those reported for the BAS. Jorm et al. (1999) found that BIS scores were positively associated with a measure of neuroticism and negative emotionality. Johnson et al. (2003) also reported that, in their study with 1803 participants, higher BIS scores were identified as a risk factor for depression and anxiety. Cox and Blount (1998) reported that high levels of punishment-avoidance (or BIS+ responsivity) protected students from excessive drinking. Likewise, Knyazev et al. (2004) found that high BIS scores in female participants were a protection factor from substance use. However, the opposite trend was found among males; it was concluded that high BIS scores were a risk factor for substance use in males. In a study that contained more female than male participants, Cook (2004) found that high-BIS participants consumed more alcohol than low-BIS participants. These findings show that BIS

measures can be used to assess the determinants of alcohol use, although the effects may vary with sample characteristics.

Aims of Study One

The review of RST presented in Chapter 2 points to the relevance of its two key concepts, namely BAS activation and sensitivity to reward (SR) and BIS activation and sensitivity to punishment (SP), to the study of determinants of alcohol use and misuse. The review of the recent studies in the present chapter also points to the possible utility of the RST personality constructs in addictive behaviours research. The series of studies reported in this thesis have been designed to establish the position that Gray's personality constructs can take within Cox and Klinger's model, a well established multidimensional model of alcohol use reviewed in Chapter 2.

The aims of the first study in this thesis were modest. Study 1 was designed to employ one of the well established RST tools in a sample of socially drinking students. Students' levels of alcohol use and demographic information were recorded; the latter included one (novel) measure derived from the multidimensional model of alcohol use. Thus the associations between BIS and BAS sensitivities and alcohol use could be examined, and the RST questionnaire could be validated in the present sample prior to its administration in the remaining studies that employed a wider spectrum of tests for other putative determinants of alcohol use. The instruments administered to students in Study 1 are fully described in the Method section.

The predictions that were formed prior to Study 1 were as follows. First, it was expected that there would be separable main effects for SP (anxiety) and SR (impulsivity) among normal samples of student drinkers. Second, it was expected that SP and SR would be independently associated with students' alcohol consumption,

with no interactions. These two predictions were made on the basis of previous RST findings, which showed that anxiety and impulsivity tend to be independent determinants and predictors of alcohol use in normal samples and samples with pathological disorders such as alcohol dependence (Franken, 2002). Third, it was expected that students who reported having current concerns related to their alcohol use would tend to drink more than those who did not report such concerns. This prediction was derived from earlier work within Cox and Klinger's model (Cook, 2004). Finally, it was expected that age of onset of drinking would be associated with sensitivity to reward and alcohol use (Dougherty, Mathias, Tester, & Marsh, 2004; Wiesbeck, Dursteler-MacFarland, Weijers, Boening, 2005).

METHOD

Ethical Approval

The research reported here complied with the BPS ethical guidelines; it was reviewed and approved by the School of Psychology Ethics Committee. Informed consent was obtained from all participants, who were aware of their right to withdraw without penalty (none did so); they were debriefed at the end of the procedure and their questions were answered by the researcher. Personal information that could identify individuals was not recorded on the study materials; the researcher kept contact details of the participants who decided to return and participate in Study 2 only as long as it was necessary, and in separate locked files. Data were kept on a password-protected computer in a locked office. Consent forms and information sheets given to participants are presented in Appendix 2.

Participants

A total of 273 participants from Bangor University were recruited and tested. Participants were recruited through the School of Psychology SONA website, which is used to recruit psychology students. They volunteered as part of a requirement for their degree in psychology and earned 2 course credits and £4 worth of printer credits. The SONA advertisement stated that, “The research was investigating the relationship between personality and alcohol use among regular drinkers.”

Eighty-five percent of the sample were female ($n = 232$) and 15% were male ($n = 41$). Participants' ages ranged between 18 and 30 years for males (median = 20 years) and between 18 and 41 years for females (median = 20 years).⁵ The participants reported having between 12 and 20 years of formal education (median = 15 years). They first drank alcohol between the ages of 8 and 20 (median = 15 years) and have been drinking alcohol on a regular basis for between 0 and 25 years (median = 3 years). Ninety-seven percent of the sample stated that they would be willing to participate in Study 2 ($n = 266$) and the remaining 3% ($n = 7$) did not.

The sample used was not selected on the Department of Health's guidelines for excessive drinking (14-21 units of alcohol per week for females, and 21-28 units per week for males). This allowed the researcher to sample the full range of student drinkers for the study.

⁵ Ranges and medians are reported as more appropriate measures of spread and central tendencies, respectively, rather than commonly used standard deviations and means, because age score distributions were very skewed and kurtosed in the present sample.

Instruments

Participants were asked to complete three questionnaires. These included a measure of personality, a measure of alcohol use, and a demographics sheet.

Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ)

The SPSRQ (Torrubia, Avila, Molto, & Caseras, 2001) was selected for its brevity, ease of use, reliability, internal consistency, and validity. This is a 48-item self-report questionnaire that assesses the responsivity of the BIS and BAS systems when presented with signals for punishment or reward. Each system's sensitivity is assessed by a 24-item subscale. The scale responses are in a Yes or No format, and are scored by summing all the Yes responses for each subscale, to give an index for each system's activity and sensitivity.

Sensitivity to punishment (SP) is measured with the odd numbered items. They assess the BIS system's tendencies to inhibit movement toward goals that result in aversive consequences. The scale was designed to assess the worries and cognitive processes produced by possible threats, punishers, and failures. "Do you often refrain from doing something because you are afraid of it being illegal" is a sample SP item. Sensitivity to reward (SR) is measured by the even numbered items. They assess the BAS system's impulsivity tendencies. The scale was designed to assess impulsivity by presenting items based upon individual responses to money, sex partners, social-events, power, and impulsive-sensation seeking. "Does the good prospect of money motivate you strongly to do some things" is a sample SR item. The SPSRQ is presented in Appendix 3.

Torrubia et al. (2001) reported good internal consistencies for the SP and SR scales ($\alpha = .84$ and $\alpha = .76$). The alphas for the SP and SR scales in this study were also found to be good ($\alpha = .85$ and $\alpha = .74$).

Alcohol Use Questionnaire (AUQ)

AUQ (Cox, 2000) is a brief six-question alcohol-screening instrument that measures the quantity and frequency of habitual drinking, from which total weekly consumption can be calculated. The response categories for the amount of alcohol consumed range from one to fifteen units of alcohol, and there is the option for an individual to specify a figure above the specified range. Questions for the frequency of drinking have a time range that incorporates daily, weekly, monthly, and yearly drinking. A sample questionnaire is presented in Appendix 4.

Demographics Questionnaire

On the demographic questionnaire, participants were asked to state their gender, age, number of years in education, educational level (undergraduate or postgraduate), department of study, age of first drink alcohol (age of onset), and how many years they had been drinking alcohol on a regular basis. In addition to these, the questionnaire included an item derived from the Personal Concerns Inventory (PCI)—a research tool developed within Cox and Klinger's motivational model of alcohol use. The inventory was used in Study 2; it is described in detail in Chapter 5 (see Appendix 11). In the present study, participants were simply asked to state: (1) how many personal concerns they had, (2) in which life areas were those concerns, and (3)

whether these concerns were related to their current level of alcohol use (either causing them to drink or resulting from their drinking).

The last of these questions was a novel item, not contained in the PCI.

Previous research showed that number of life concerns is related to people's alcohol use (Man, Stuchikova, & Klinger, 1998). This relationship was investigated further by Cook (2004), who added a general question in which participants were asked to state whether any of their concerns were related to their current level of alcohol use; he reported that these concerns were positively correlated with participants' weekly alcohol use and their drinking frequency. Therefore, in the present study, participants were also presented with this question, and further asked to specify whether their concern was a cause of their alcohol use or resulting from their alcohol use. It was hypothesised that having concerns that are directly related to current level of alcohol use would show a strong relationship with the amount of alcohol that a person consumed, as measured by the AUQ. A sample demographics questionnaire is given in Appendix 5.

Procedure

Upon their arrival, participants were informed that the study was investigating the relationships between personality and alcohol use in regular drinkers of alcohol. Once participants gave their written informed consent, they completed a questionnaire packet containing the SPSRQ, AUQ, and demographics sheet. Questionnaires were completed in a quiet research room, in single or group (up to eight participants) testing sessions. Sessions lasted between 40 and 60 minutes, and the researcher was available at all times to deal with any queries. After completing the questionnaires, each participant was verbally debriefed and given a debriefing sheet (see Appendix

6). Participants were given a full explanation of the procedures employed and were able to ask questions. Participants were then paid, thanked, and discharged from the study with the knowledge that they could contact the researcher later if they had further questions.

Plan of Analysis

Participants' responses on the questionnaires were scored and their data were entered into a spreadsheet; the statistical package SPSS was used for all analyses, unless stated otherwise.

Distribution Analyses and Data Transformations

Descriptive statistics were calculated to establish that the data from the sample were normally distributed. According to Miles and Shevlin (2001, p. 74), values for skewness and kurtosis are useful for detecting any deviations from normality. If values for skew and kurtosis are greater than twice the standard error then the distribution differs significantly from a normal distribution. If skew values are < 1 then there should be little problem with the distribution. If skew values are > 1 and < 2 then there may be some problems with the distribution, but if skew values are > 2 then there are problems with the distribution. On this basis, any distributions that were significantly skewed with a value > 2 were transformed. Likewise, any variables that were found to have a kurtosis value > 2 were also transformed.⁶ Transformations are a

⁶ The values for skew and kurtosis can have a + (plus) or – (minus) sign, the direction of the sign is ignored; it is the value of the index that is important and not the direction of the index.

viable procedure for dealing with outliers and failures of normality, linearity, and homoscedasticity (Tabachnick & Fidell, 2007, p. 86).⁷ They may also improve the strength of the results obtained from the data analysis by reducing the impact of outliers. The best transformation method to use is one that yields a value for skewness and kurtosis that is close to zero. One of the most efficient transformations is the Rankit area transformation. Thirteen indices were found to be non-normally distributed by being skewed and kurtosed; 3 of the 13 indices were from the demographics questionnaire (age, age of first drink, and number of years drinking on a regular basis), and the remaining indices were all derived from the AUQ. These indices were normalised through area transformations with the Rankit procedure in SPSS⁸; this was done because these variables were subsequently included in statistical analyses that required normality.

Next, the Rankit transformed variables were then re-examined for normality with the Shapiro-Wilk test. This test is used when the sample contains between 3 and 2000 participants. Skew and kurtosis values for the variables were also re-examined. No variables were found to violate the assumptions for normality after being transformed.

⁷ Homoscedasticity is the assumption that the variability in scores for one variable is roughly the same at all values of the other variable. When it is not met, variables are not homoscedastic and not normally distributed (Miles & Shevlin, 2001).

⁸ Rankit uses the formula $(r - 1/2) / w$, where w is the number of observations and r is the rank.

Significance Testing

Pearson correlations were used to identify any significant relationships between the demographic variables and personality factors, and between demographic variables and AUQ indices. These correlations also allowed the researcher to identify any variables that needed to be controlled for in Step 1 of the regression analysis. Two-tailed, independent samples t-tests were used to establish if there were any significant differences among the independent variables that were attributable to sample characteristics (e.g., gender). The accompanying Levene's test was used to identify any violations of homogeneity of variance. No violations of homogeneity of variance were found. Cohen's d measure of effect size was used to identify the magnitude of the differences between the means. The conventional standards for d are: small, $d = 0.2$; medium, $d = 0.5$; and large, $d = 0.8$. These t-tests identified any variables that needed to be controlled for in Step 1 of the regression analysis.

Next, hierarchical multiple regression was used to predict maximum amount consumed per day and weekly alcohol consumption scores, because they were the variables of interest. Further, maximum amount consumed per day and weekly alcohol consumption scores were predicted for those participants who had a concern and had no concern related to their current level of alcohol use.

Regression Diagnostics

Normality assumptions and regression diagnostics were performed for each model by plotting the residuals. Residuals are the differences between the observed and the predicted values. Inspecting the residuals is a valid methodology for identifying outliers. Outliers can also affect distributions, causing the assumptions of

regression to be violated, or drive the direction of the results because the data contains influential observations (Pedhazur, 1997). Besides examining the residuals in plots, Cook's distance (D) values were examined for the models. Cook's D is used to identify an influential observation whose influence is due to its standing on the independent variable or variables, the criterion variable, or both (Pedhazur, 1997, p.51). Values for Cook's D were within the desired ranges for the regression models.

The independent variables were also examined for collinearity and multicollinearity by examining the tolerance and variance inflation factor (VIF) values in the regression output tables. Simple collinearity occurs when two independent variables correlate highly. Multicollinearity occurs when more than two independent variables correlate highly. Collinearity (and multicollinearity) increases the uncertainty around the parameter estimates and results in an increased standard error (Miles & Shevlin, 2001). Two methods were used for detecting collinearity violations. First, the tolerance index was examined in the regression output. The tolerance of an independent variable is the extent to which the independent variable cannot be predicted by the other independent variables in the regression model. The values for tolerance can vary between 0 (zero) and 1. A tolerance value of 0 indicates that the independent variable can be completely predicted from the other independent variables, and thus, there is perfect collinearity. Likewise, if the tolerance value is close to 1 then the independent variable is completely uncorrelated with the other independent variables in the regression model (Miles & Shevlin, 2001). Second, the Variance Inflation Factor (VIF) index in the regression output table can be examined for violations of collinearity when the model contains more than two independent variables. Variance Inflation Factor relates to the amount the standard error of an independent variable has increased because of collinearity. Miles and Shevlin (2001)

argue that when the Variance Inflation Factor value reaches 4, the standard error has doubled indicating that collinearity has become a major problem. Furthermore, if independent variables are highly correlated it can be difficult to distinguish the unique effect of each independent variable on the criterion variable. This problem can be resolved by removing variables from the data set or by combining them (Pedhazur, 1997). Values for tolerance and the Variance Inflation Factor were within the desired ranges for the regression models.

Effect Size Calculations for Regression Models

Post hoc effect size and power calculations were performed for each hierarchical regression model with G*Power 3.⁹ This allowed the researcher to measure the magnitude of the combined impact of the predictors on the criterion variable and identify if the regression models were spurious. The effect size conventions for Cohen's f^2 are: small, $f^2 = 0.02$; medium, $f^2 = 0.15$; and large, $f^2 = 0.35$. Power was set at .80 for the regression models. The regression models were found to have a power $>.80$ and were accepted as being non-spurious. The critical value for α was set at .05 (two-tailed) for the correlations, independent t-tests, and regression models.

⁹Settings used in G*Power 3: Test family: F tests, Statistical test = Multiple regression (Omnibus R^2 deviation from zero), Type of power analysis: Compute achieved power given α , sample size and effect size.

RESULTS

Preliminary Data Analysis

Descriptive statistics for the participants' scores, differences associated with sample characteristics and reported life concerns, and the relationships between demographic variables, personality variables, and AUQ indices, are presented first.

SPSRQ and AUQ Scores

Table 3.1 presents the means and standard deviations for the SPSRQ personality variables and the untransformed AUQ quantity and frequency indices.

Table 3.1.

Means and standard deviations for untransformed variables.

| Measure | Variables/Indices | M | Sd |
|---------|--|-------|-------|
| SPSRQ | Sensitivity to punishment | 11.21 | 5.33 |
| | Sensitivity to reward | 10.88 | 4.03 |
| AUQ | Typical days drinking per week (F) | 1.89 | 1.22 |
| | Typical amount consumed per day (Q) | 6.80 | 4.33 |
| | Typical amount consumed for the week (Q) | 13.08 | 12.20 |
| | Maximum days drinking per week (F) | 0.67 | 0.56 |
| | Maximum amount consumed per day (Q) | 12.01 | 5.65 |
| | Maximum amount consumed for the week (Q) | 7.49 | 9.36 |
| | Number of days since last drink (F) | 4.15 | 7.15 |
| | Units consumed on the last day you drank (Q) | 7.18 | 5.79 |
| | Number of days drinking per week (F) | 2.49 | 1.36 |
| | Weekly alcohol consumption scores (Q) | 20.57 | 17.41 |

Note: F = frequency and Q = quantity.

Differences Associated with Sample Characteristics

Two-tailed t-tests were used to identify any significant differences that were attributable to sample characteristics. Males were found to score higher on 1 demographic question, 1 AUQ quantity index, and 1 SPSRQ score. First, they were found to be older (transformed $M = .31$, $sd = .87$; untransformed $M = 20.90$, $sd = 2.75$) than their female (transformed $M = -.03$, $sd = .94$; untransformed $M = 20.53$, $sd = 3.91$) counterparts; $t(271) = 2.15$, $p < .05$, $d = 0.26$ (small effect). Second, they were found to score higher on typical amount consumed per day (transformed $M = .30$, $sd = .90$; untransformed $M = 7.80$, $sd = 4.18$) than their female (transformed $M = -.04$, $sd = .98$; untransformed $M = 6.62$, $sd = 4.34$) counterparts; $t(271) = 2.08$, $p < .05$, $d = 0.25$ (small effect). Third, males scored higher on sensitivity to reward ($M = 12.10$, $sd = 3.84$) than their female ($M = 10.67$, $sd = 4.01$) counterparts; $t(271) = 2.11$, $p < .05$, $d = 0.26$ (small effect).

Relationships Between Demographic and Personality Variables

Pearson correlations were performed to establish the relationships between the responses for the five demographic questions and the SPSRQ personality variables. SR was found to be negatively related to age ($r = -.22$, $p < .01$) and to number of years drinking on a regular basis ($r = -.14$, $p < .05$). SP was also negatively related to number of years drinking on a regular basis ($r = -.18$, $p < .01$).

Relationships Between Demographic Variables and AUQ Indices

Table 3.2 presents the correlations for the demographic variables and AUQ indices. Two demographic variables, age and age of first drink, correlated with some

of the AUQ indices. No relationships were found between sex, number of years in education, and number of year drinking on a regular basis and the AUQ indices.

The relationship between the AUQ indices and the last variable presented in the demographic sheet, examining participants' life concerns and their relationship to alcohol use, is presented separately in the following section.

Table 3.2.

Correlations for demographic variables and AUQ indices.

| Measure | Indices | Age | Age of first drink |
|---------|--|--------|--------------------|
| AUQ | Typical days drinking per week (F) | Ns | -.12* |
| | Typical amount consumed per day (Q) | -.15* | -.14* |
| | Typical amount consumed for the week (Q) | -.12* | -.14* |
| | Maximum days drinking per week (F) | -.14* | Ns |
| | Most units drunk per day (Q) | Ns | -.23** |
| | Maximum amount consumed for the week (Q) | -.13* | -.15* |
| | Number of days since last drink (F) | Ns | .12* |
| | Units consumed on the last day you drank (Q) | Ns | Ns |
| | Number of days drinking per week (F) | Ns | -.12* |
| | Weekly alcohol consumption scores (Q) | -.18** | -.20** |

Note: The correlations were performed with the Rankit transformed AUQ indices. F = frequency and Q = quantity. * $p < .05$, ** $p < .01$, and Ns = $p > .05$.

Relationships Between Concerns About Use and Alcohol Use

Participants were asked to state if they had a personal concern that is related to their current level of alcohol use. Then they were asked to specify the life area that the concern was in, and state how the concern was related to their current level of alcohol use. Fifty-two percent of the sample stated that they had no concerns related to their current level of alcohol use ($n = 142$); the remaining 48% ($n = 131$) stated that they

had at least one concern (24%, $n = 65$), or two concerns (17%, $n = 46$), or three concerns (6%, $n = 16$), or four concerns (1%, $n = 4$). Table 3.3 presents the frequency counts and percentages for the life areas that the alcohol-related concerns appeared in.

Table 3.3.

Frequency counts and percentages for life areas.

| Life areas | Number of respondents | % |
|-----------------------------------|-----------------------|------|
| Home and household matters | 12 | 4.4 |
| Relationships | 43 | 15.8 |
| Self-changes | 12 | 4.4 |
| Health and medical matters | 18 | 6.6 |
| Employment and finances | 7 | 2.6 |
| Love, intimacy and sexual matters | 13 | 4.8 |
| Education and training | 14 | 5.1 |
| Leisure and recreation | 6 | 2.2 |
| Other substance use | 6 | 2.2 |

Note: $N = 131$

Next, participants indicated how the concern was related to their current level of alcohol use. Eighteen percent stated that their concern causes them to engage in drinking behaviours ($n = 49$), the remainder stated that their concern was a result of their drinking behaviour (13%, $n = 36$), and 17% stated that their concern was not a cause or result of their drinking behaviour ($n = 46$). There was no difference in weekly alcohol consumption between the participants who stated that their concern causes them to drink, and those who stated that their concern is a result of their

drinking; therefore, the two subgroups were considered together in the further analyses.

The frequency counts for the responses were recoded 0 (not related) or 1 (directly related). The responses, having no concerns or having a concern that was not a result or cause of current level of alcohol use, were coded 0. The response, having a concern that causes or is a result of current level of alcohol use, was coded 1. The dummy coded variable was used as the grouping variable in a two-tailed *t*-test to identify the differences between the groups on the AUQ indices.

Five differences were found for how concern related to current level of alcohol use. Participants who had a concern that was directly related to their current level of alcohol use scored higher than those who had no concerns related to their current level of alcohol use on: (1) maximum amount consumed per day, (2) maximum days drinking per week, (3) maximum amount consumed for the week, and (4) weekly alcohol consumption scores. Those participants who had no concerns related to their current level of alcohol scored higher on number of days since last drink than those who had a concern related to their current level of alcohol use. Table 3.4 presents the statistical values for the tests

Table 3.4.

Concern differences on AUQ indices.

| Variables | Concern related (n = 85) | | No concern (n = 188) | | <i>T(df)</i> | <i>p</i> | <i>d</i> |
|--------------------------------------|-----------------------------|-----------|-------------------------|-----------|--------------|----------|----------|
| | <i>M</i> | <i>Sd</i> | <i>M</i> | <i>Sd</i> | | | |
| Maximum amount consumed per day | .20 | .92 | -.09 | 1.01 | 2.26 (271) | .025 | 0.27 |
| Maximum days drinking per week | .22 | .97 | -.10 | .93 | 2.58 (271) | .010 | 0.31 |
| Maximum amount consumed for the week | .28 | 1.00 | -.12 | .97 | 3.09 (271) | .002 | 0.37 |
| Number of days since last drink | -.25 | .90 | .15 | .94 | 3.27 (271) | .001 | 0.40 |
| Weekly alcohol consumption scores | .21 | 1.00 | -.10 | .98 | 2.40 (271) | .017 | 0.29 |

Note: The t-tests were performed with the Rankit transformed AUQ indices. Cohen's *d* values: small, *d* = 0.2; medium, *d* = 0.5; and large, *d* = 0.8.

Personality and AUQ Correlates

Table 3.5 presents the correlations for SPSRQ scores and AUQ indices. SR was found to correlate with 6 AUQ quantity indices and 1 AUQ frequency index; SP did not correlate with any of the indices.

Table 3.5.

Correlations for SPSRQ scores and AUQ indices.

| Measure | Variables | SP | SR |
|---------|--|----|-------|
| AUQ | Typical days drinking per week (F) | Ns | Ns |
| | Typical amount consumed per day (Q) | Ns | .25** |
| | Typical amount consumed for the week (Q) | Ns | .15* |
| | Maximum days drinking per week (F) | Ns | .16** |
| | Maximum amount consumed per day (Q) | Ns | .22** |
| | Maximum amount consumed for the week (Q) | Ns | .21** |
| | Number of days since last drink (F) | Ns | Ns |
| | Units consumed on the last day you drank (Q) | Ns | .16** |
| | Number of days drinking per week (F) | Ns | Ns |
| | Weekly alcohol consumption scores (Q) | Ns | .21** |

Note: The correlations were performed with the Rankit transformed AUQ indices. F = frequency and Q = quantity. * $p < .05$, ** $p < .01$, and Ns = $p > .05$.

Regression Analyses

The main analyses of the AUQ Quantity indices included: (1) predicting maximum amount consumed per day and (2) weekly alcohol consumption scores for the whole sample. This was done to examine the amount of unique variance in AUQ scores that could be explained by the demographic and predictor variables (e.g., age of first drink and sensitivity to reward). The same variables were also examined in the planned subgroup analyses for those participants who had an alcohol-related personal concern and those who did not. This was done to account for more of the unique

variance in alcohol consumption scores. None of the models violated regression assumptions or diagnostic tests.

Predicting Maximum Amount Consumed Per Day

Age of first drink was controlled for in Step 1, because the failure to control for other variables that are associated with the independent or the criterion variable can result in bias beta coefficients and produce a spurious model. Therefore, by controlling for the effects of the demographic variable, the main effect for the independent variable (SR) was reliably and accurately established. The criterion variable was the AUQ maximum amount consumed per day scores (binge amount) and the independent variable was sensitivity to reward. Age of first drink accounted for 5.3% of the variance in maximum amount consumed per day scores, $F = 15.21 (1, 271), p < .01$. Sensitivity to reward entered into Step 2 yielded a significant R^2 change ($p < .01$). The main effect for sensitivity to reward accounted for another 4.3% of the unique variance. The final model accounted for 9.6% of the variance in maximum amount consumed per day scores, $F = 14.33 (2, 270), p < .01, f^2 = 0.11$ (small effect). The power of the full model with two predictors was 0.99 (see Table 3.6).

Table 3.6.

Hierarchical multiple regression analysis of the ability of age of first drink and sensitivity to reward to predict maximum amount consumed per day scores.

| Variable | <i>B</i> | <i>SEB</i> | β | R^2 | ΔR^2 | $\Delta F(df)$ | Δp |
|-----------------------|----------|------------|---------|-------|--------------|----------------|------------|
| Step 1 | | | | .05 | .05 | 15.21 (1,271) | .000 |
| Age of first drink | -.24 | .06 | -.23*** | | | | |
| Step 2 | | | | .09 | .04 | 12.80 (1,270) | .000 |
| Age of first drink | -.23 | .06 | -.22*** | | | | |
| Sensitivity to reward | .05 | .01 | .21*** | | | | |

Note: The regression was performed with the Rankit transformed demographic and AUQ indices. *** $p < .00$.

Predicting Weekly Alcohol Consumption

Age and age of first drink were controlled for in Step 1. The criterion variable was the AUQ derived weekly alcohol consumption scores and the independent variable was sensitivity to reward. The control variables accounted for 6.4% of the variance in weekly alcohol consumption scores, $F = 9.26$ (2, 270), $p < .01$. Sensitivity to reward entered into Step 2 yielded a significant R^2 change ($p < .01$). The main effect for sensitivity to reward accounted for another 3.1% of the unique variance. The final model accounted for 9.5% of the variance in weekly alcohol consumption scores, $F = 9.41$ (3, 269), $p < .01$, $f^2 = 0.10$ (small effect). The power of the full model with three predictors was 0.99 (see Table 3.7.).

Table 3.7.

Hierarchical multiple regression analysis of the ability of age, age of first drink, and sensitivity to reward to predict weekly alcohol consumption scores.

| Variable | <i>B</i> | <i>SEB</i> | β | R^2 | ΔR^2 | $\Delta F(df)$ | Δp |
|-----------------------|----------|------------|---------|-------|--------------|----------------|------------|
| Step 1 | | | | .06 | .06 | 9.26 (2,270) | .000 |
| Age | -.17 | .06 | -.16** | | | | |
| Age of first drink | -.19 | .06 | -.18** | | | | |
| Step 2 | | | | .09 | .03 | 9.16 (1,269) | .003 |
| Age | -.13 | .06 | -.12* | | | | |
| Age of first drink | -.19 | .06 | -.18** | | | | |
| Sensitivity to reward | .05 | .02 | .18** | | | | |

Note: The regression was performed with the Rankit transformed demographic and AUQ indices. * $p < .05$ and ** $p < .01$.

Additional regression models were performed for the separate AUQ indices.

These models were not included in the results section because they were considered to be minor findings that added nothing to the overall strength of the results, but they are available upon request. For example, sensitivity to reward accounted for 2.5% of the variance in units of alcohol consumed on the last day a participant drunk scores.

Concern Type and Maximum Amount Consumed Per Day

The dummy coded concern variable was used as the selection variable in multiple regression because the primary direction of the analyses was to predict maximum amount consumed per day (binge amount) scores for those participants who had a concern that was directly related to their current level of alcohol use or not.

In the first hierarchical regression analysis for those who had a concern, the age of first drink control variable was entered into Step 1, because it was considered

to be a distal predictor of maximum amount consumed per day scores. The criterion variable was maximum amount consumed per day scores and the selection criteria for the model was having a concern directly related to current level of alcohol use. Age of first drink accounted for 10.2% of the variance in maximum amount consumed per day scores, $F = 9.40 (1, 83), p < .01$. Sensitivity to reward entered into Step 2 yielded a significant R^2 change ($p < .00$). The main effect for sensitivity to reward accounted for another 9.2% of the unique variance. The final model accounted for 19.4% of the variance in maximum amount consumed per day scores, $F = 9.87 (2, 82), p < .01, f^2 = 0.24$ (large effect). The power of the full model with two predictors was 0.98 (see Table 3.8.).

In the second hierarchical regression analysis for those who had no concern, the age of first drink control variable was again entered into Step 1. The criterion variable was maximum amount consumed per day scores and the selection variable was having no concern directly related to current level of alcohol use. Age of first drink accounted for 4.1% of the variance in maximum amount consumed per day scores, $F = 7.99 (1, 186), p < .01$. Sensitivity to reward entered into Step 2 yielded a significant R^2 change ($p < .00$). The main effect for sensitivity to reward accounted for another 2.5% of the unique variance. The final model accounted for 6.6% of the variance in maximum amount consumed per day scores, $F = 6.51 (2, 185), p < .00, f^2 = 0.07$ (small effect). The power of the full model with two predictors was 0.90 (see Table 3.9.).

Table 3.8.

Hierarchical multiple regression analysis of the ability of age of first drink and sensitivity to reward to predict maximum amount consumed per day scores for the concern group.

| Variable | <i>B</i> | <i>SEB</i> | β | R^2 | ΔR^2 | $\Delta F(df)$ | Δp |
|-----------------------|----------|------------|---------|-------|--------------|----------------|------------|
| Step 1 | | | | .10 | .10 | 9.40 (1,83) | .003 |
| Age of first drink | -.30 | .10 | -.32** | | | | |
| Step 2 | | | | .19 | .09 | 9.38 (1,82) | .003 |
| Age of first drink | -.25 | .10 | -.27* | | | | |
| Sensitivity to reward | .07 | .02 | .31** | | | | |

Note: The regression was performed with the Rankit transformed demographic and AUQ index for the concern group. * $p < .05$ and ** $p < .01$.

Table 3.9.

Hierarchical multiple regression analysis of the ability of age of first drink and sensitivity to reward to predict maximum amount consumed per day scores for the no concern group.

| Variable | <i>B</i> | <i>SEB</i> | β | R^2 | ΔR^2 | $\Delta F(df)$ | Δp |
|-----------------------|----------|------------|---------|-------|--------------|----------------|------------|
| Step 1 | | | | .04 | .04 | 7.99 (1,186) | .005 |
| Age of first drink | -.21 | .07 | -.20** | | | | |
| Step 2 | | | | .06 | .02 | 4.87 (1,185) | .029 |
| Age of first drink | -.21 | .07 | -.21** | | | | |
| Sensitivity to reward | .04 | .02 | .16* | | | | |

Note: The regression was performed with the Rankit transformed demographic and AUQ index for the no concern group. * $p < .05$ and ** $p < .01$.

Concern Type and Weekly Alcohol Consumption

In the first hierarchical regression analysis for those who had a concern, age of first drink was controlled for in Step 1. The criterion variable was the AUQ derived weekly alcohol consumption scores and the selection variable was having a concern related to current level of alcohol use. Age of first drink alcohol accounted for 16.1% of the variance in weekly alcohol consumption scores, $F = 15.89 (1, 83), p < .00$. Sensitivity to reward entered into Step 2 yielded a significant R^2 change ($p < .00$). The main effect for sensitivity to reward accounted for another 11.2% of the unique variance. The final model accounted for 27.3% of the variance in weekly alcohol consumption scores, $F = 15.43 (2, 82), p < .00, f^2 = 0.38$ (large effect). The power of the full model with two predictors was 0.99 (see Table 3.10).

In the second hierarchical regression analysis for those who had no concern, the age of first drink control variable was again entered into Step 1. The criterion variable was the AUQ derived weekly alcohol consumption index and the selection variable was having no concern directly related to current level of alcohol use. Age of first drink accounted for 1.3% of the variance in weekly alcohol consumption scores, $F = 2.42 (1, 186), p > .05$. Sensitivity to reward entered into Step 2 yielded a non-significant R^2 change ($p > .05$). The main effect for sensitivity to reward accounted for another 1.5% of the unique variance. The final model accounted for 2.8% of the variance in weekly alcohol consumption scores, $F = 2.67 (2, 185), p > .05, f^2 = 0.03$ (small effect). The power of the full model with two predictors was 0.55 (see Table 3.11.).

Table 3.10.

Hierarchical multiple regression analysis of the ability of age of first drink and sensitivity to reward to predict weekly alcohol consumption scores for the concern group.

| Variable | <i>B</i> | <i>SEB</i> | β | R^2 | ΔR^2 | $\Delta F(df)$ | Δp |
|-----------------------|----------|------------|---------|-------|--------------|----------------|------------|
| Step 1 | | | | .16 | .16 | 15.89 (1,83) | .000 |
| Age of first drink | -.42 | .11 | -.40*** | | | | |
| Step 2 | | | | .27 | .11 | 12.73 (1,82) | .001 |
| Age of first drink | -.36 | .10 | -.34** | | | | |
| Sensitivity to reward | .09 | .03 | .34** | | | | |

Note: The regression was performed with the Rankit transformed demographic and AUQ index for the concern group. * $p < .05$, ** $p < .01$, and *** $p < .00$.

Table 3.11.

Hierarchical multiple regression analysis of the ability of age of first drink and sensitivity to reward to predict weekly alcohol consumption scores for the no concern group.

| Variable | <i>B</i> | <i>SEB</i> | β | R^2 | ΔR^2 | $\Delta F(df)$ | Δp |
|-----------------------|----------|------------|---------|-------|--------------|----------------|------------|
| Step 1 | | | | .01 | .01 | 2.42 (1,186) | .122 |
| Age of first drink | -.11 | .07 | -.11 | | | | |
| Step 2 | | | | .02 | .01 | 2.90 (1,185) | .090 |
| Age of first drink | -.12 | .07 | -.12 | | | | |
| Sensitivity to reward | .03 | .02 | .12 | | | | |

Note: The regression was performed with the Rankit transformed demographic and AUQ index for the no concern group.

DISCUSSION

Study 1 was designed to examine the associations between BIS and BAS sensitivities, assessed by the SPSRQ as SP and SR, and alcohol use, assessed by the AUQ, in a student sample. The measures employed also included demographic variables, such as age of drinking onset and the presence of alcohol-related concerns. Several predictions were made at the onset of the study; these are discussed next.

Relationship Between SP, SR, and Students' Alcohol Use

Two predictions were made on the basis of previous RST findings, reviewed in Chapter 2 and the Introduction section of the present chapter. First, it was expected that there would be separable main effects for SP and SR among normal samples of student drinkers; second, it was expected that SP and SR would be independently associated with students' alcohol consumption, with no interactions.

More specifically, it was predicted that BAS sensitivities, measured with the SR scale of the SPSRQ, would correlate with and predict both quantity and frequency AUQ indices of students' drinking behaviour. Likewise, it was expected that BIS sensitivities, measured with the SP scale of the SPSRQ, would correlate with and predict both quantity and frequency AUQ indices of students' drinking behaviour. The results only partially bore out these predictions.

Considering the correlations reported in this study, SR was found to be positively associated with 6 AUQ quantity indices and with 1 AUQ frequency index. Therefore, in the present sample, SR was more associated with the quantity than the frequency of drinking behaviour. These results are consistent with those reported by O'Connor and Colder (2005), and Pardo, Aguilar, Molinuevo, and Torrubia (2007),

published after Study 1 was completed. Both these studies also found positive correlations between measures of BAS sensitivity and the quantity of alcohol use among students.

In the present study, SP scores were not associated with the quantity and frequency of alcohol use. This was unexpected, because a positive relationship was previously reported between SP and AUQ weekly alcohol consumption scores in an earlier, small sample study which used similar measurements ($r = .38, p < .01; N = 46$; see Cook, 2004). This discrepancy could perhaps be attributed to lower levels of alcohol consumption in this study. The average alcohol consumption for this study was 20 units per week and in the previous study it was 25 units per week. The most plausible explanation for the failure to find any associations is sample characteristics. This sample of normal drinkers may have been reward drinkers rather than avoidance or escape drinkers, as evidenced by the stronger associations between sensitivity to reward and alcohol consumption, although the sample mean was lower for sensitivity to reward than sensitivity to punishment. The relationships between sensitivity to punishment and alcohol consumption may also be stronger in excessive or problem drinkers than normal social drinkers. Nevertheless, this discrepancy in findings mirrors the wider RST literature, where the relations between BIS sensitivities and substance use tend to be mixed and inconsistent. As noted in the Introduction section of this chapter, sometimes researchers find relations between BIS sensitivities and substance use and sometimes they do not (see Dawe et al., 2007). Considering the findings published after the present study was completed, Taylor and colleagues found high sensitivity to punishment scores to be associated with drug use problems in a high negative emotionality group of students (Taylor, Reeves, James, & Bobadilla, 2006). Likewise, high-BIS scores have been found to be positively

associated with disordered and dysfunctional eating patterns and negative marijuana expectancies (Hasking, 2006; Loxton & Dawe, 2006, Simons & Arens, 2007).

Considering the regression analyses in the present study, it was found that BAS sensitivities measured with the SR scale predicted AUQ quantity indices, but not frequency indices. After controlling for age and AFD, SR predicted maximum amount consumed per day (binge amount) and weekly alcohol consumption scores, accounting for unique variance in each model (4.3% and 3.1%, respectively). As was expected, the full models for each AUQ index accounted for unique variance in alcohol use behaviours (9.6% and 9.5%, respectively). The effect sizes for the models were small, Cohen's f^2 ranged from 0.10-0.11; none of the models were spurious (power = 0.99). Hence, the models were considered to be reliable and robust. Overall, these findings were consistent with the tenets of the motivational model of alcohol use, which would predict that personality variables (SP and SR in this study) account for only a small amount of the unique variance in students' drinking. This is because the motivational model considers that personality is just one among many different determinants of alcohol use.

BAS sensitivities were the best predictors of students drinking behaviours, after controlling for the demographic variables. Again, the results were in the same direction as those reported by O'Connor and Colder (2005), and Pardo et al. (2007). Furthermore, the results are consistent with other studies that have investigated the relationships between BAS sensitivities and addictive behaviours, such as eating disorders, drug use problems, and polydrug use (e.g., Hasking, 2006; Hundt et al., 2008; Knyazev, 2004). They also agree with the trends reported in the literature after this study had been completed. BAS sensitivities assessed with the SPSRQ or BIS/BAS scales have been found to be positively associated with the use of drugs and

or alcohol, the frequency of drug use, the quantity of alcohol use, disordered eating patterns, hazardous drinking, positive marijuana expectancies, drug use problems, and negatively with age of onset of alcohol use (Franken & Muris, 2006, Franken, Muris, & Georgieva, 2006; Hasking, 2006; Hundt et al., 2008; Loxton & Dawe, 2006, Pardo et al., 2007; Simons & Arens, 2007). They are also consistent with the findings of studies that have employed alternative measures of BAS sensitivities in student, community, and clinical samples, such as extroversion, sensation-seeking, impulsivity, novelty-seeking, and reward-drive (see Aston, 2003; Moeller & Dougherty, 2002, Dawe & Loxton, 2004, Dawe et al., 2007). The results from the regression models indicate that SR is a better predictor of how much students will drink, rather than when they will drink.

Relationship Between Life Concerns, SR, and Alcohol Use

The third study prediction was derived from earlier work within Cox and Klinger's model (Cook, 2004); it was expected that students who reported having current concerns related to their alcohol use would tend to drink more than those who did not report such concerns. More specifically, it was also expected that participants who had a concern related to their current level of alcohol use would: (1) drink more when binge drinking (maximum amount consumed per day), and (2) drink more per week (weekly alcohol consumption scores) than participants with no concerns related to their current level of alcohol use.

As was expected, participants who reported having a concern related to their current level of alcohol use were found to binge drink on more days of the week (maximum days drinking per week), drink more when binge drinking (maximum amount for the week), have a higher weekly binge drinking total (maximum amount

for the week), and consume more alcohol per week (weekly alcohol consumption scores), than participants with no concerns. In addition, participants with no concerns scored higher on number of days since last drink (having a longer period of abstinence) than participants with a concern.

Next, concern type was used as a selection variable in regression analyses to produce concern and no concern models for a binge drinking episode (maximum amount consumed per day) and weekly alcohol consumption scores. The results for the regression models further clarified the difference between the two subgroups, as follows.

In the concern model for a binge drinking episode SR accounted for an additional 9.2% of the unique variance and in the no concern model SR only accounted for 2.5% of the unique variance. The full model for the concern group accounted for 19.4% of the unique variance and in the no concern group the full model only accounted for 6.6% of the unique variance. The effect size for the concern model was large (Cohen's $f^2 = 0.24$), and for the no concern group the effect size was small (Cohen's $f^2 = 0.07$). None of the models were spurious (power was .98 and .90, respectively); they were reliable and robust. These results show that BAS sensitivities accounted for a much larger amount of the unique variance in binge drinking episode for the subgroup who reported having alcohol-related concerns.

A similar pattern of results was observed for weekly alcohol consumption. In the concern model SR accounted for an additional 11.2% of the unique variance, whereas in the no concern model SR only accounted for 1.5% of the unique variance. The full model for the concern group accounted for 27.3% of the unique variance and for the no concern group the full model accounted for only 2.8% of the unique variance. The effect size for the concern model was large (Cohen's $f^2 = 0.38$), and for

the no concern group the effect size was small (Cohen's $f^2 = 0.03$). Again, the full model for the concern group was found to be reliable and robust (power = .99), whereas the model for the no concern group was found to be unreliable and non-robust (power = .55). These results show that BAS sensitivities accounted for a much larger amount of the unique variance in weekly alcohol consumption for the subgroup who reported having alcohol-related concerns.

These results are interesting, and the effects appear convincing: BAS sensitivities were a significant predictor of binge drinking episodes and weekly alcohol consumption scores only in those students who reported having alcohol-related concerns. No similar results have been reported in the literature to date, and this finding requires a careful replication. It is possible that having an alcohol-related concern or problem is a negative consequence of alcohol use that might be associated with a reward sensitive personality type; naturally, no direction of causality can be claimed from this study. Hayaki and colleagues reported that impulsive drug users experience more negative consequences of substance abuse (e.g., adverse life events) than non-impulsive drug users (Hayaki, Stein, Lessor, Herman, & Anderson, 2005). Strengthening the personal impact of negative consequences of alcohol use in drinkers may facilitate the outcomes of intervention programmes that are designed to reduce drinking and the development of non-alcohol related life incentives. Cox and Klinger (1988) proposed that effective treatment programmes should address the cognitive-affective-motivational determinants of the decision not to drink if they are to have successful outcomes (see Chapter 5 for a fuller discussion on negative consequences motives for abstaining from alcohol).

Relationship Between Age of Onset of Drinking, SP, and SR

The final prediction for Study 1 was that age of onset of drinking would be associated with sensitivity to reward and alcohol use, because similar results have been reported in the literature (Dougherty et al., 2004; Wiesbeck et al., 2005). No predictions were made regarding the possible relationship with sensitivity to punishment, because no such findings have been reported to date.

The results showed that those students who began drinking at an earlier age scored higher on SP and on SR than those who started drinking when they were comparably older. Thus age of onset of drinking correlated with both SR and SP, which is a novel finding. The finding that individual differences in BAS sensitivities were associated with early onset of alcohol use behaviours is consistent with the claims of the reward drive-rash impulsiveness model and the theoretical debates surrounding the role of impulsivity (BAS+) in substance abuse, outlined in the Introduction section of this chapter (see Dawe et al., 2007; Moeller & Dougherty, 2002). No previous studies have reported an association between early drinking onset and BIS sensitivities in younger participants. One possible explanation is that anxiety-prone participants may start drinking alcohol earlier to reduce negative emotional states and for stress-reduction reasons.

Other Findings

The noteworthy relationships among the demographic variables, SPSRQ scores, and AUQ indices, are outlined below.

Younger participants were likely to score higher on SR than their older counterparts. This is consistent with the findings of Jorm et al. (1999), who reported

that older participants tend to score lower on measures of BIS and BAS sensitivities. The temporal instability of BIS and BAS sensitivities has been directly investigated in a large twin-study that appeared in press after Study 1 was completed (Takahashi, Yamagata, Kijima, Shigemasu, Ono, & Ando, 2007). These researchers measured BIS and BAS sensitivities of 448 pairs of twins at two time points over a 2-3 year period, and concluded that individual differences owed more to genetic than environmental factors. The temporal instability of BIS and BAS sensitivities in social drinking students' warrants further investigation in longitudinal studies.

Second, significant associations were found for Age and most AUQ scores. Thus younger participants reported that they drank more alcohol overall and on binge days, consumed alcohol more frequently than their older counterparts, and so on. These findings are consistent with a most recent review of the predictors of alcohol use behaviours in 1st year college (university) students (Borsari, Murphy, & Barnett, 2007). Indeed, about half of the sample in the present study ($N = 127$) were also 1st year students (ages between 18 and 19 years). In addition, age of first drink (an alternative measure of age of onset of drinking) showed a similar pattern of results to those for age; it was found to be associated with many of the AUQ indices. Similar results were reported by Pardo et al. (2007), who also found that age of onset of alcohol consumption was negatively related to a quantity and frequency measure of alcohol consumption in a student sample. Indeed, people in the 18-24 year old age range tend to consume the largest quantities of alcohol, and are likely to go on to develop alcohol related problems if they continue to drink heavily (Department of Health, 2006). Furthermore, early onset drinking may contribute to the development of alcohol misuse problems and alcohol use disorders (AUD) in later adulthood (see Borsari et al., 2007; Pitkanen, Lyyra, & Pulkkinen, 2005 for a fuller discussion).

The gender differences found in this study were as follows. Males were older; they scored higher on typical daily alcohol consumption and on SR than females. This was in line with a recently published study by the Office of National Statistics who found that, on average, British males drink twice as much alcohol as females (18.7 units vs 9 units per week; ONS, 2008). Some of these differences in alcohol consumption may be due to differences in body mass composition and the way both sexes metabolise alcohol (see Li, Beard, Orr, Kwo, & Ramchandani, 1998). The differences in SR scores are also in line with previous research, which showed that males score higher on self-report and behavioural measures of BAS sensitivity (Caseras, Avila, & Torrubia, 2003; Pickering, et al, 1997; Gray, 1997; Torrubia et al., 2001). In addition, females tend to have fairly stable scores for N and E, but N tends to decrease quite rapidly in late adolescence (see Bazana & Stelmack, 2004). Overall, the stability of any gender differences for SR and typical daily alcohol consumption can only be established by replicating the study with a larger, more representative sample of male participants. Males were under-represented in this study ($n = 41$), although the ratio of males to females was representative of psychology undergraduates as a whole.

Conclusions

Study 1 was designed to explore the relationship between RST personality measures and drinking in a sample of students. The results showed that BIS and BAS sensitivities are related to students' alcohol use in several ways, and the chosen measure of these sensitivities, SPSRQ, was shown to be valid in the present population. Participants' age, the age at which they first decided to drink alcohol, and their sensitivity to reward scores were shown to be determinants of their drinking, but

these variables only accounted for a small amount of the unique variance in drinking. However, the results also showed that the amount of unique variance that these determinants account for could be increased if a measure of concern type or alcohol-related problems is used.

Methodologically, the study employed a cross-sectional sample of social drinking students, who completed self-report measures of personality and alcohol use. Although no directionality can be claimed, the results are in line with those that have used student, community, and clinical populations. Hence, the findings from this study are considered to be reliable, valid, and robust.

Theoretically, the results are in agreement with the tenets of Cox and Klinger's motivational model of alcohol use. In this model, personality traits—such as sensitivity to reward—are said to be distal determinants of alcohol use; they form a part of the motivational pathway (e.g., as past drinking experiences) leading to alcohol use. In the motivational model, drinking is determined by a multitude of variables, which are expected to act jointly. In this study, one such relationship was demonstrated with the introduction of alcohol-related concerns to improve the predictive ability of the personality variable.

Therefore, then next research task is to identify the combined personality, emotion, and motivational determinants that better characterise the involvement of BIS and BAS sensitivities and drinking within the framework of the motivational model of alcohol use. This should further clarify the role and predictive utility of the BIS and BAS within Cox and Klinger's model. These determinants are presented and discussed next, in Chapter 4.

CHAPTER 4

Motivational Determinants of Alcohol Use

People might choose to use alcohol for a multitude of reasons. They might have a personality type that predisposes them to engage in self-defeating risky behaviours. They might believe that they cannot deal with life's stressors or problems because they have no control over the outcome of life events. They might be attempting to reduce negative affect through some form of self-medication, or they might be using alcohol to enhance positive affective states. They might believe that their own personal development is less important than others' personal development because they have no incentives, goals, or aspirations that yield rewards or pleasure, or increase self-worth and general well-being. It might be that all of these determinants, or only some of them, are related to and mediate the relationship between individual differences in predispositions and alcohol use. It is these distal and proximal determinants that are considered in this chapter, from the perspective of Cox and Klinger's motivational model of alcohol use and reinforcement sensitivity theory (RST).

The chapter is separated into sections which present a brief summary of BIS and BAS functions followed by reviews of the literature on coping behaviour, control beliefs, emotional regulation, motivational structure, alcohol use motives, and motives for abstaining from alcohol. Summaries of RST research into each of these topics are given when appropriate, as are the predictions that could be derived from the existing literature.

Following Cox and Klinger's model, the perspective taken in this chapter is that there are two motivational pathways that drive the final decision to drink, or not to drink, alcohol. These pathways are alternative forms of the same process; they comprise different distal and proximal determinants. For example, one pathway might comprise sensitivity to reward, impulse control difficulties, and enhancement alcohol use motives, whereas the alternative pathway might comprise sensitivity to punishment, emotional dysregulation, and coping alcohol use motives. Motives for abstaining from alcohol are negative predictors of alcohol consumption and are expected to be related to BIS and BAS responsivity. Sensitivity to punishment is expected to be associated with negative-consequence motives for abstaining from alcohol, whereas sensitivity to reward is expected to be associated with dispositional risk motives for abstaining from alcohol. Both of these motives may be proximal determinants of alcohol consumption that internally motivate the decision not to drink.

A brief overview of how the reviewed proximal and distal determinants fit within Cox and Klinger's motivational model of alcohol use is given at the end of the chapter. Thus, the hypothesised relationships and associations are presented before these variables are investigated in Study 2, reported in the following chapter.

BIS and BAS Functions

Reinforcement Sensitivity Theory, reviewed in Chapter 2, postulates that the BIS is the neural centre responsible for individual differences in punishment sensitivity. It is associated with aversive motivation, negative affective states, and the inhibition of behaviour. It is sometimes called the 'brake' because it attempts to stop or slow down behavioural responses. By inhibiting behaviour the BIS can drive

actions like the avoidance of anti-goals (Carver, Sutton, & Scheier, 2000). Anti-goals are goals that a person wants to withdraw from or avoid. The activation of BIS goal-pursuits is associated with aversive, avoidant, or negative incentive motivated actions. This concept is comparable to Cox and Klinger's negatively framed goals that a person wants to get rid of, prevent, or avoid.

In contrast, the BAS is the neural centre responsible for individual differences in reward sensitivity, positive affective states, and disinhibited behaviours in BAS+ individuals. It is sometimes called the 'accelerator' because it attempts to increase the rate of behavioural responses. By initiating behaviour the BAS is associated with the tendency to pursue goals. In a contrary manner to the BIS, the activation of BAS goal-pursuits is associated with appetitive, approach, or positive incentive motivated actions. This concept is similar to Cox and Klinger's account of positively framed goals that a person wants to maintain, get, or achieve (this point is further discussed in a later section, which presents the theoretical relations between motivational structure and RST). Figure 4.1 illustrates the functions of the BIS and BAS.

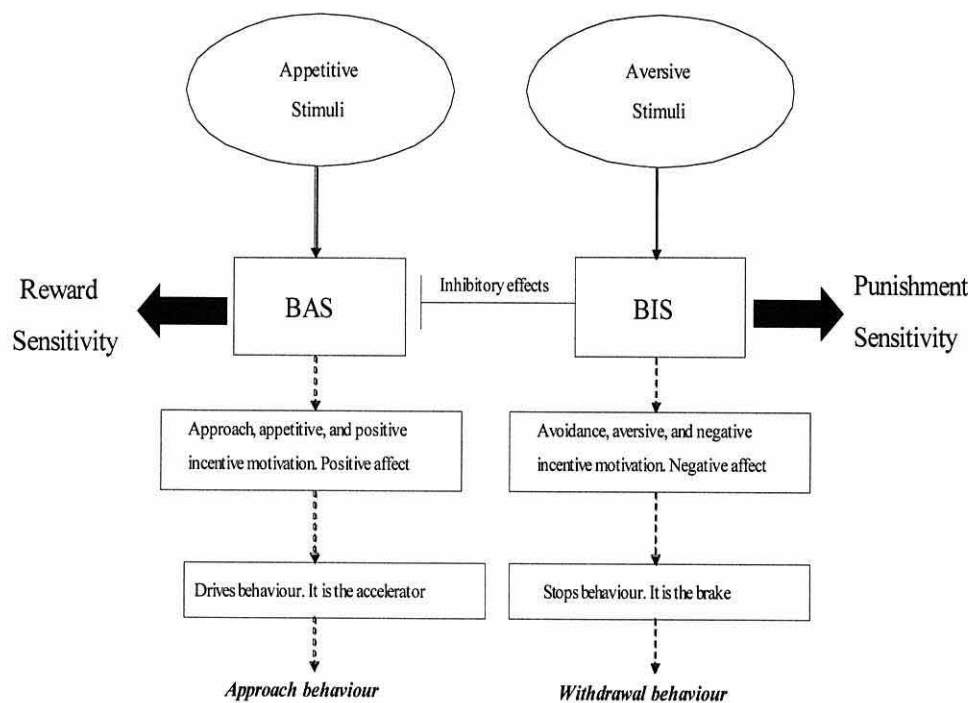


Figure 4.1. The responses of the BIS when activated by an aversive stimulus and the BAS when activated by an appetitive stimulus.

Coping Behaviour

Early psychologists did not consider coping to be trait-like; they considered it to be due to individual differences in ego-defence responses to stress and anxiety, or to represent the dynamic transaction between the organism and the stressful situation (Bishop, Tong, Diong, Enkelmann, Why, Khader, & Ang 2001). Psychodynamic and process-based models view coping in different ways. The advocates of psychodynamics posit that coping is an involuntary and unconscious process, whereas

the advocates of the process-based model posit that coping is a voluntary and conscious process. According to Bishop et al. (2001), process-based models of coping excluded personality because they considered coping to be a dynamic process that changed according to the situation and the evaluation made. The psychodynamic and process-based models are still used in psychological research, but they have been heavily criticised by contemporary researchers, who claimed that coping styles tend to be consistent across situations, and are associated with different personality types (see Carver, Scheier, & Weintraub, 1989; McCrae & Costa, 1986).

Contemporary research has investigated the differences between dispositional and situational coping (e.g., Bouchard, Guillemette, & Landry-Leger, 2004). Dispositional or trait-like coping models propose that individuals develop habitual ways of dealing with stressors, and that these habitual ways are consistent because they can affect reactions in new situations (Carver & Scheier, 1994). Hence, dispositional coping is what individuals usually do when they are under stress. For example, Watson and Hubbard (1996, p. 737) found that neuroticism was associated with a reduction in problem-focused coping (focusing on ways to resolve the stressful problem or situation), and with passive and ineffective coping, whereas extroversion was associated with an increase in emotion-focused coping, positive reappraisal, and problem-focused coping. Emotion-focused coping means focusing on the negative emotions that are associated with the stressful problem or situation (e.g., fear and anxiety). Watson and Hubbard concluded that personality traits are important for determining how individuals adapt to the ongoing stresses and strains of life.

Another key factor in personality and coping research is how a person appraises the problem or stressor. Folkman and Lazarus (1988) proposed that a person's decision to employ emotion- or problem-focused coping depends on how he

or she interprets the potential problem or stressor. Chang (1998) posited that there are two kinds of appraisal decisions, primary and secondary appraisal. Primary appraisal refers to the set of cognitions regarding the impact or significance of the stressful encounter for that person. Secondary appraisal refers to a set of cognitions concerning the person's resources or options for dealing with the stressful situation or problem (Bouchard et al., 2004, p. 222). Neuroticism has been found to be positively associated with primary appraisal and negatively with secondary appraisal, whereas extroversion was found to be negatively associated with primary appraisal and positively with secondary appraisal (Bouchard et al., 2004).

These findings indicate that BIS+ individuals might: (1) be aware of the impact a problem or stressor can have on them, (2) overestimate the significance of the stressor, and (3) believe they do not have the resources or skills to deal with the problem or stressor. Likewise, BAS+ individuals might: (1) not perceive how a problem or stressor can impact on them, (2) underestimate the significance of the problem or stressor, and (3) believe that they can deal with the problem or stressor in whatever way it impacts on them. This maladaptive perception is comparable to unrealistic control beliefs regarding the control of uncontrollable life events (control beliefs are reviewed below).

According to Lazarus and Folkman (1988), if people perceive the problem or stressor to be controllable, they will employ problem-focused coping behaviours; conversely, if they perceive the problem or stressor to be uncontrollable or unchangeable, they will employ emotion-focused coping behaviours. This premise now includes challenging and threatening problems or stressors. A family of adaptive coping behaviours such as problem-solving will be employed if the problem or stressor is perceived to be challenging, whereas a family of maladaptive coping

behaviours like escape will be employed if the problem or stressor is perceived to be threatening (Skinner, Edge, Altman, & Sherwood, 2003). Again, this premise is associated with the normal functions of the BAS and BIS/FFFS in response to appetitive and aversive stimuli, respectively.¹

The Relationship Between RST and Coping Behaviour

Very few studies have investigated the relationships between RST and coping behaviours (see Ferguson, 2001; Hasking 2006, 2007). Ferguson (2001) investigated the structural relationships between Eysenck's personality dimensions, Gray's RST constructs, and dispositional coping in a factor analysis study. The research found that Eysenck's neurotic-introvert personality dimension was equivalent to Gray's BIS. Neurotic-introverts tended to engage in inhibitory behaviours or avoidance strategies when dealing with stressful life-events (e.g., behavioural and mental disengagement). The relationship between neuroticism, introversion, and coping was used to illustrate the structural similarities between BIS and maladaptive coping behaviours. The relationship between extroversion and coping was linked with the activity of the BAS. Extroverts (or BAS+ individuals) tended to engage in emotion-focused coping because of its potential for reward (e.g., seeking emotional social support). Ferguson (2001, p. 321) concluded that personality variables and coping dispositions cannot be treated as separate entities because coping behaviours are habitual responses to stressful situations that form a part of personality.

¹ As previously stated in Chapters 2 and 3, the measure of BIS sensitivities used in this thesis (the SP scale of the sensitivity to punishment and sensitivity to reward questionnaire) is now considered to represent the combined functioning of the BIS and FFFS.

In Hasking's (2006) study of a sample of disordered eating and excessive drinking adolescents, BAS drive scores were found to be positively associated with non-productive, problem-solving, and reference to others' coping. BAS fun-seeking scores were found to be positively associated with non-productive and problem-solving coping. BAS reward-responsiveness scores were found to be positively associated with all three coping behaviours. BIS scores were found to be positively associated with non-productive and reference to others coping, but more strongly with non-productive coping. Furthermore, non-productive coping was found to predict unhealthy eating attitudes and interact with BAS drive scores to predict unhealthy eating attitudes. Hasking also found that problem-solving coping was a negative predictor of harmful drinking.

In another study of delinquent behaviour in adolescents, Hasking (2007) found identical relationships between the BAS, BIS, and coping behaviours scores. Again, non-productive coping behaviour predicted and interacted with BAS drive scores to predict delinquent behaviour. Problem-solving coping was again found to be a negative predictor of maladaptive behaviour (e.g., delinquency). This time, problem-solving coping was found to mediate the relationship between BAS reward-responsiveness and delinquency. The findings for both of these studies indicate that BAS and BIS sensitivities and coping behaviours are consistent across samples. Hence, Hasking's studies indicate that BAS sensitivities tend to be associated with both adaptive (e.g., problem-solving) and maladaptive (e.g., non-productive) coping behaviours, whereas BIS sensitivities tend to be more associated with maladaptive coping behaviours. Furthermore, problem-solving coping tends to be a negative predictor of maladaptive behaviours like harmful drinking and interacts with BAS scores to predict maladaptive behaviours. Hasking's findings are consistent with those

of Watson and Hubbard (1996), and Ferguson (2001), who found strong relationships between measures of N (or BIS) and maladaptive coping behaviours, and E (or BAS) and the use of adaptive and maladaptive coping behaviours. In addition to this, SP scores were found to be strongly associated with maladaptive coping behaviour in a small sample of student drinkers (Cook, 2004).

In both of Hasking's studies RST personality constructs were treated as distal determinants of behaviour and coping behaviours were treated as proximal determinants, because Hasking believes that individuals tend to engage in coping behaviours immediately before or after a problem has occurred.

Theoretical Predictions Regarding RST and Coping Behaviour

Theoretically and conceptually, it can be argued that a BIS+ person who cannot successfully manage life problems or stressors might use alcohol to cope with these problems, to deny that these problems exist, to avoid having to deal with these problems, to escape from these problems, or to reduce the negative emotionality associated with these problems. Drinking to cope with life problems or stressors can serve many functions for many individuals, especially if they are anxiety-prone (BIS+). Moreover, the relationship between a SP+ predisposition and drinking to cope may differ according to the degree of alcohol use (e.g., drinking to cope may serve different functions in social drinkers compared to problematic drinkers).

In contrast, BAS+ person might use problem-focused coping behaviours to solve simple or minor life problems, but engage in maladaptive and avoidant coping behaviours when encountering problems or stressors that require a great deal of time and effort to resolve. Such individuals might also use avoidant coping to evade

negative stimuli or the negative emotionality associated with some life problems or stressors.

The view taken in this thesis is in agreement with that of Watson and Hubbard (1996) and Ferguson (2001), that coping and personality are not separate constructs, but are different aspects of the same behaviour that are consistent from situation to situation. Personality and coping are being viewed as serving similar functions, in that both can direct behaviour in ways that compliment each other. For example, a BIS+ predisposition may cause an individual to move away from threatening or aversive stimuli and the rate of withdrawal may be facilitated by an avoidance coping style. Heponiemi, Keltikangas-Jarvinen, Puttonen, and Ravaja (2003) found that BIS sensitivities mediated withdrawal behaviour by predisposing a person to engage in poor and inactive coping behaviours. Like personality traits, the present researcher considers coping behaviours to be distal predisposition determinants of the final decision to drink in Cox and Klinger's model.

Realistic and Unrealistic Control Beliefs

At first, the concept of realistic and unrealistic control beliefs may appear to be a fairly new phenomenon in psychological research, but its roots can be traced back to more established theories of human behaviour (e.g., Bandura's Self- Efficacy Theory, Rotter's Internal and External Locus of Control Theory, Seligman's Learned Helplessness Theory). Adler (1930) proposed that striving to demonstrate one's competence and superiority over events is an individual's major motivational force. Likewise, Kelly (1955), in his classic account of man as a scientist, stated that, "man is constantly matching expectancies against perceptions in an effort to obtain maximum predictability and control". Whereas, Kelley (1971) suggested that the

purpose of causal analysis and attribution for events in one's world is the "effective exercise of control in that world" (cited in Burger & Cooper, 1979, p. 22).

The term "control" is used frequently in the psychological literature but it is rarely defined. One of the best and clearest definitions was given by Thompson (1981). She proposed that control is the belief that one possesses a response that can influence the aversiveness of an event. This definition appears to exclude peoples' perceptions of control that are associated with appetitive events.

Early models proposed typologies of control along behavioural and cognitive dimensions. For example, Averill's (1973) three-dimensional model included behavioural, cognitive, and decisional control, whereas Miller (1979) developed a four-dimensional behavioural control model. There are two fundamental problems with these early models: (1) they assumed that people only attempt to control or modify the impact of aversive events, and (2) they did not clarify the differences between the control of controllable and uncontrollable life events.

Most of the early research tended to investigate participants' perceptions of control whilst they performed certain noxious and invasive tasks that were considered to be controllable or uncontrollable by the researcher (e.g., receiving an electric shock or viewing photos of violent deaths). Contemporary coping-behaviour, goal-setting, and control beliefs research argues that any attempt to control or modify a problem, stressor, or event whose outcome is uncontrollable is actually maladaptive because it can result in various negative consequences (e.g., reducing problem-solving skills). Clearly, people's perceptions of control of naturalistic appetitive and aversive daily events are more important than their perceptions of control whilst exposed to noxious experimental conditions or stimuli.

Other psychologists viewed control beliefs from a motivational perspective. For example, White (1959) was of the opinion that people's rewards for interacting with the environment are the feelings of competence they obtain from exerting control over it (termed effectance motivation). White went on to conclude that people have unique individual differences in their perceptions of control that are shaped and differentiated through life experiences. Burger and Cooper (1979, p. 383) were of the opinion that individual differences in desire for control are consistent across situations and operate in a trait-like manner. They proposed that a person high on desire for control will be assertive, decisive, and active. This type of person will try to influence others when it is advantageous; he or she will also tend to avoid aversive situations or try to manipulate the event(s) to ensure a positive end-state. In contrast, individuals low in desire for control will be non-assertive, passive, and indecisive. They will not try to influence others or the event(s) and prefer for other people to make decisions for them. Burger and Cooper concluded that a person's general level of desire for control interacts with situational variables to account for behavioural differences, more so in situations where control is seen as being advantageous and not in situations where it is not advantageous (e.g., trivial, minor, or unimportant situations). The most salient factor in Burger and Cooper's work that applies to this thesis is that individual differences in control are trait-like motivational constructs that can be categorised.

In the mid 1990s, Zuckerman and colleagues defined the differences between perceptions of realistic and unrealistic control beliefs. Realistic control beliefs are associated with events that are objectively controllable, whereas unrealistic control beliefs are associated with illusory perceptions of control of events when control is not objectively possible (Zuckerman, Knee, Kieffer, Rawsthorne, & Bruce, 1996).

High realistic control beliefs are associated with the achievement of goal-directed behaviours, general well-being, and the use of adaptive coping strategies when dealing with adversity (Zuckerman, Knee, Kieffer, & Cagne, 2004). Someone low on realistic control beliefs is more likely to use maladaptive coping behaviours and experience a number of negative consequences; he or she has the classic learned-helplessness behaviour profile. High unrealistic control beliefs are counterproductive in that they interfere with adaptive coping behaviours (e.g., problem-focused), because people are attempting to solve problems that are not solvable (see Folkman, 1984). Low unrealistic control beliefs are more adaptive because they do not interfere with adaptive coping behaviours, as people are not trying to solve unsolvable problems or achieve unrealistic goals (Zuckerman et al., 2004).

As was previously stated, control beliefs are comparable to secondary appraisal in coping behaviour, which is the set of cognitions a person has concerning one's resources or options for dealing with the stressful situation or problem. Control beliefs or strategies have also been separated into primary and secondary control. Primary control refers to any set of behaviours that are directed at effectively changing the environment so it meets the person's needs and desires, whilst secondary control refers to any set of cognitive processes that a person uses to compensate for the losses in primary control (Heckhausen & Schulz, 1995).

The theoretical relations between RST and primary and secondary control were explored by Windsor, Anstey, Butterworth, and Rodgers (2008). They proposed that the BAS is responsible for a person's approach-motivated, goal-directed environmental interactions, so it must be associated with primary control, because it allows the person to instigate and develop behaviour-event contingencies. On the other hand, the BIS is responsible for a person's avoidance-motivated, goal-directed

environmental interactions. It might be associated with decreased control in persons with an overactive BIS. By inhibiting goal-directed activities, the BIS might cause a person to experience fewer opportunities to establish control through behaviour-event consequences. Windsor and colleagues concluded that an overactive BIS causes a person to avoid the use of adaptive behavioural responses when encountering negative events that may help him or her to reassert control.

Zuckerman et al. (1996) argued that the benefits of perceived control depend on the actual "controllability" of the event. Perceptions of realistic control are considered adaptive because they increase motivation and persistence, especially in theories of goal-setting where the attainment of goals (or resolving concerns) is fundamentally important (e.g., motivational model of alcohol use). As discussed in the following section, control perceptions are a key indicator of an adaptive motivational structure: if respondents on a measure of goal-setting behaviour do not perceive that they have control over their actions to attain goals, then they are more likely than not to fail in their attempts to attain these goals. Furthermore, control beliefs probably share some degree of common variance with personality, affective, and motivational determinants of alcohol use (e.g., coping and enhancement alcohol use motives).

Theoretical Predictions Regarding RST and Control Beliefs

As with personality traits, the present researcher considers realistic and unrealistic control beliefs to be distal predispositional determinants of the final decision to drink in Cox and Klinger's model. No published studies have examined the relations between realistic and unrealistic control beliefs and RST constructs. At a theoretical and conceptual level an overactive BIS is expected to be negatively

associated with realistic control beliefs, whilst an overactive BAS is expected to be positively associated with realistic and unrealistic control beliefs.

Emotional Regulation

Cox and Klinger's motivational model of alcohol use holds that a person's final decision to drink or not depends on the net expected affective change from drinking. A person is motivated to drink alcohol for a variety of reasons; thus a drinker may decide to drink because he or she has deficits in adaptively maintaining or enhancing emotional states and is unable to regulate them. Self-regulation can be defined as involving cognitive, motivational, affective, behavioural, and physiological processes that are involved in the control of goal-directed behaviours (e.g., BIS/BAS/FFFS functions). Emotional regulation can be defined as the strategies a person employs to influence, experience, and modulate emotions; it may include suppression or cognitive-reappraisal of the stressful situation, event, or problem (Gross, Richards, & John, 2006).

Carver and Scheier (1990) emphasised that emotions are not just associated with the resolving of goals, because during goal-directed behaviours emotions can provide feedback on goal progress, possible attainment, and possible failure. Positive emotions can arise in goal-striving before the goal is attained. For example, people may feel happier just because they have made good progress toward the goal (e.g., writing the component parts of a theoretical thesis chapter). Likewise, negative emotions such as anger, frustration, and sadness can appear because the person has failed to make any concrete progress toward the goal, even though the goal is still attainable (e.g., failing to complete chapters so a doctoral thesis can be submitted without delay). Figure 4.2 illustrates Carver and Scheier's affect discrepancy-reducing

systems. The approach system will produce positive effect if the progress towards the appetitive goal is above standard, and negative affect if the progress is below standard. The avoidance system operates in the same manner to produce negative and positive affect during aversive goal-striving.

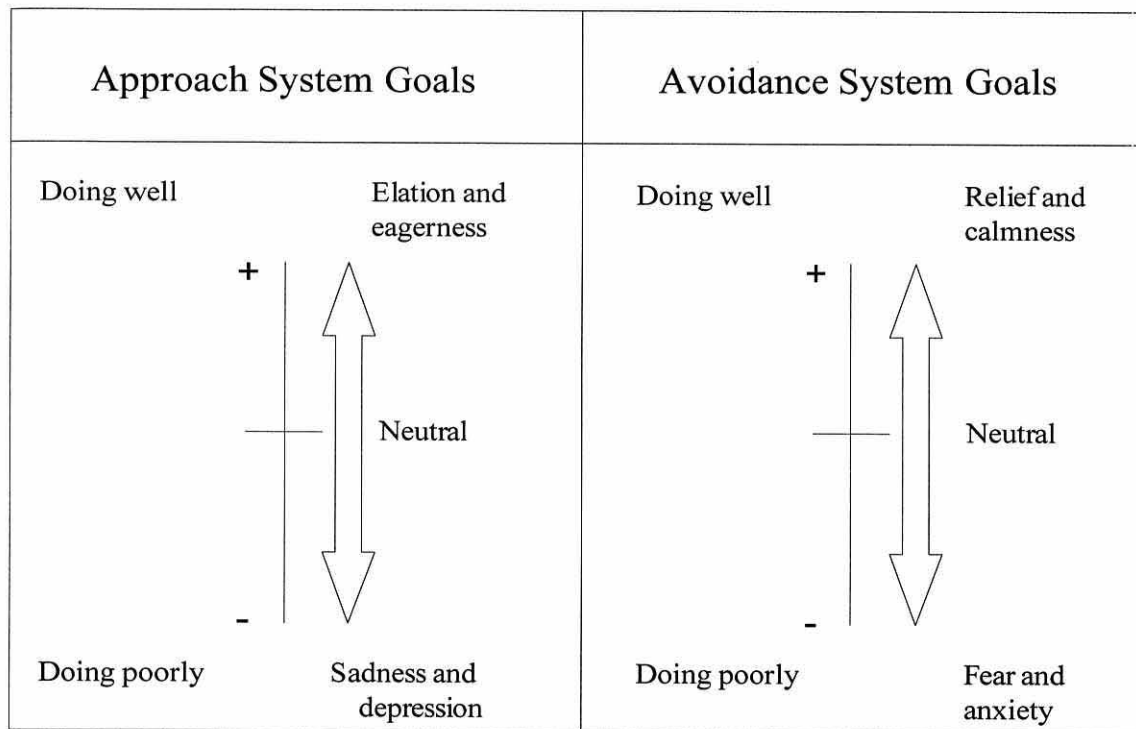


Figure 4.2. A schematic representation of Carver, Sutton, and Scheier's (1990) affect discrepancy-reducing systems.

Negative emotions can also be adaptive if they provide feedback concerning one's goals, especially if they indicate that one's goals need to be reconsidered and reprioritised (e.g., another goal may appear that needs immediate attention and action). Hence, emotions can function as an information process, because they provide immediate feedback on a person's concerns, needs, and goals at a given

moment, especially when there is a discrepancy between the current state of the sub-goal, the goal and the desired end-state of the goal type (e.g., Mennin, Heimberg, Turk, & Fresco, 2005).

Contemporary theories of emotion continue to emphasise the adaptive value of emotions, because emotions are considered to be cues for action and action tendencies that help to establish, maintain, or disrupt relationships with internal or external environments that are important to the person (Barlow, 2002). It follows that emotions serve a very important function in internally and externally generated goal-directed activities. If a person is to attain emotionally rewarding goals then he or she needs to be able to adaptively regulate goal-directed emotional states. In published studies, normal levels of adaptive emotional regulation have been associated with positive emotional health, whereas low levels of adaptive emotional regulation (sometimes termed affective or emotional dysregulation) have been associated with pathological disorders, such as Generalised Anxiety Disorder (GAD), depression, Borderline Personality Disorder (BPD), self-harming, panic attacks, and substance use (Bornovalova, Gratz, Daughters, Nick, Delaney-Brumsey, Lynch, Kosson, & Lejuez, 2008, in press; Garnefski & Kraaij, 2007; Gratz & Gunderson, 2006; Mennin et al., 2005; Newhill, Mulvey, & Pilkonis, 2004; Tull & Roemer, 2007).

Adaptive emotional regulation involves flexibility in the use of emotion regulation strategies (Gratz & Roemer, 2004). Emotion regulation strategies are considered to be psychologically demanding, when a person is distressed an attentional shift is more likely to occur that draws the person's attention toward more immediate pleasure-seeking goals, such as drinking alcohol (see Gross 2007).

Affective or emotional dysregulation refers to maladaptive patterns of emotional regulation which impair daily life functioning (Carver, Lawrence, &

Scheier, 1996). Affective dysregulation can be the result of affective liability, or alexithymia, or experiential avoidance. Affective liability refers to the frequency, speed, and range of changes in affective states; it has been found to be associated with substance use problems (Oliver & Simons, 2004; Simons & Carey, 2002). Another related construct is alexithymia, which is the inability to recognise and express emotions (Cox, Blount, & Rozak, 1998). Alexithymia has been found to be associated with ineffective maladaptive coping behaviours and is now considered to be a negative facet of emotion regulation (Velasco, Fernandez, Paez, & Campos, 2006). Experiential avoidance has been defined as the unwillingness to remain in contact with aversive personal experiences and the actions taken to lessen the impact of aversive experiences or the events that elicit them (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Stewart and colleagues investigated anxiety-sensitivity, experiential avoidance, alexithymia and alcohol use motives among 188 university students. They found that conformity alcohol use motives were predicted by anxiety-sensitivity and alexithymia, whereas coping and enhancement alcohol use motives were predicted solely by experiential avoidance (Stewart, Zvolensky, & Eifert, 2002).²

Research into difficulties in emotional regulation is concerned with how people control behaviour when they are experiencing negative emotions, rather than the control of emotions per se (e.g., Gratz & Gunderson, 2006; Gratz & Roemer, 2004; Tull & Roemer, 2007). The former reflects difficulties in the understanding and awareness of emotions and is marked by deficits in the behavioural self-regulation of affective states and self-control over affect-driven behaviours (Carver, 2006; Carver

² Anxiety-sensitivity is defined in the section covering drinking motives.

et al., 1996; Carver, et al., 2000; Gratz & Roemer, 2004). Difficulties in emotional regulation may reflect deficits in the use of emotions to provide information. Gratz and Roemer (2004) proposed that difficulties in emotional regulation can be conceptualised as involving a lack of: (1) awareness and understanding of emotions, (2) acceptance of emotions, (3) ability to control impulsive behaviours and behave in accordance with desired goals when experiencing negative emotions, and (4) ability to use situationally appropriate emotional regulation strategies in order to meet individual goals and situational demands. Difficulties engaging in goal directed behaviours reflect difficulties in concentrating upon or accomplishing goals when experiencing negative emotions. Impulse control difficulties reflect difficulties in remaining in control of one's behaviour when experiencing negative emotions. Nonacceptance of emotional responses is the tendency to have negative secondary emotional responses to one's negative emotions or nonaccepting reactions to one's distress.

Another salient factor in emotion regulation and dysregulation research, not directly studied by Gratz and colleagues, is emotional ambivalence, a construct that is comparable to alexithymia and that shares a degree of overlap with Gratz and Roemer's constructs of nonacceptance of emotional responses and lack of emotional clarity. Emotional ambivalence is defined as the inability to accept or cope with the standard limitations of emotions (Mayer & Salovey, 1995). Research on personality and emotional ambivalence has found that when emotional ambivalence is used as a marker of emotional regulation it is positively associated with both impulsivity and anxiety. Kokkonen and Pulkkinen (2001) found that neuroticism was associated with high levels of emotional ambivalence and low levels of emotional repair, whereas extroversion was associated with lower levels of emotional ambivalence, greater

reliance on the use of emotional social support to regulate emotions (a coping behaviour), and low levels of emotional repair.

Only one study has investigated the relationship between BIS sensitivities and negative emotion regulation. Leen-Felder and colleagues found that high BIS sensitivities predicted cognitive-affective reactivity and a rumination response style. A person high in cognitive-affective reactivity is more likely to be susceptible to negative emotional states (Leen-Felder, Zvolensky, Feldner, & Lejuez, 2004). These findings are not surprising because Gray (1994) stated that the BIS is theoretically and conceptually linked to an enhanced risk for emotion-based psychopathology and dysfunctional emotional regulatory styles (e.g., anxiety and depression).

In the context of Cox and Klinger's model of alcohol use, affective or emotion regulation, affective liability, alexithymia, experiential avoidance, difficulties in emotion regulation, and EA are considered to be proximal determinants of the decision to drink. They might play an important part in a drinker's net expected affective change from drinking, which, in turn, enables them to maintain or enhance positive emotions, alleviate negative emotions, or a combination of both of these. This premise is related to the theoretical and predicted associations between alcohol use motives and BIS/BAS sensitivities. Alcohol use motives can be viewed as being another form of maladaptive emotion regulation strategy. They might be related to difficulties in emotion regulation, but are considered to serve a different function as them (this is discussed further in the section reviewing alcohol use motives).

Theoretical Predictions Regarding RST and Emotional Regulation

At a theoretical and conceptual level BIS sensitivities are expected to be related to nonacceptance of emotional responses, impulse control difficulties, and difficulties engaging in goal-directed behaviour. Similarly, BAS sensitivities are expected to be related to impulse-control difficulties and difficulties engaging in goal-directed behaviour. Research on difficulties in emotional regulation in cocaine abstinent participants found that for cocaine-dependent participants' impulse-control difficulties were a risk factor for potential relapse (Fox, Axelrod, Paliwal, & Sinha, 2007). Difficulties in emotional regulation may mediate the relationship between BIS/BAS sensitivities and volume of alcohol consumed.

Motivational Structure

Cox and Klinger define motivational structure as the characteristics of a person's goal pursuits. Hence, a person's motivational structure shows how a person relates to his or her goals and how he or she resolves them. To assess motivational structure, Klinger, Cox, and Blount (1995) developed the Motivational Structure Questionnaire (MSQ) and Cox and Klinger (2000) developed the Personal Concerns Inventory (PCI). The MSQ and PCI were designed to take idiothetic and nomothetic assessments of a respondent's goal-striving activities. Idiothetic measurements are made by asking the respondents to specify their current concerns, and nomothetic assessments are made by asking the respondents to provide ratings for the concerns that they have just listed. For example, when completing the full version of the PCI, the respondent is asked to describe his or her concerns in each life area and to indicate what he or she would like to do to resolve each concern, goal, or aspiration. The

respondent is next asked to provide ratings on a number of anchored rating scales (0 = least amount and 10 = most amount) on questions such as how committed he or she is to resolving a concern, estimating the likely chances of success for this, whether alcohol and drugs help or hinder this undertaking, and so on (Cox and Klinger, 2004). A fuller description of the research version of the PCI is given in Chapter 5.

A respondent's motivational structure can be derived from the MSQ or PCI. The indices from which a person's motivational profile is obtained can be calculated in two ways: (1) by averaging the ratings within each life area or (2) across all life areas. A person's motivational structure, when derived from the concern ratings across all life areas, can be classified as either adaptive or maladaptive (e.g., Cox, Blount, Bair, & Hosier, 2000; Cox & Klinger, 2004; Hogan, 2005; Hosier, 2001).³

In general, people with an adaptive motivational structure are more engaged in their goal pursuits. First, they tend to be emotionally engaged because they expect to gain joy if they attain goals and sorrow if they do not. Second, they tend to be more committed to goal attainment, have more success in attaining goals, have more control over attaining goals, know what to do to attain goals, and see the attainment of goals as being very important. Third, on goal-distance indices (MSQ and PCI goal-distance scales), the present researcher considers an adaptive motivational structure to be more associated with a mixture of short-term, medium-term, and long-term goal attainments (e.g., working hard to get good grades on university course work, during exams, and for the final degree classification). Some researchers have argued that the attainment of short-term goals can yield more longer-lasting regulatory changes because they provide immediate incentives and feedback about performance (e.g.,

³ Findings for motivational structure are presented in Chapter 5.

Carver & Scheier, 1982). Long-term goals yield little immediate incentives or feedback and are more likely to cause a reduction in attention or efforts to achieve them. Thus, a combination of short, medium, and long-term goals is considered to be the most adaptive for maintaining a person's attention, efforts, motivation, and self-regulatory behaviours to attain goals. A person with an adaptive motivational structure will probably set challenging but realistic sub-goals and goals to attain.

In general, people with a maladaptive motivational structure are indifferent and less engaged in their goal pursuits than those with an adaptive motivational structure. For example, individuals may indicate that they do not expect to derive emotional satisfaction from goal attainment, and show little sorrow if they fail to attain goals. Further, they may actively pursue goals that they will never realistically achieve, because they have failed to disengage from the inappropriate goals and refocus attention on the goals that they can achieve. According to Locke and Latham (1985), unrealistic goals that are difficult to achieve should be avoided because they can result in continued failure and decreased motivation. Thus, individuals with a maladaptive motivational structure are more likely than not to set unrealistic long-term goals that they will never achieve, and failing to attain goals will cause a further decrease in the motivation to set, maintain, and attain goals. If people have unfavourable expectancies about their abilities to attain goals they might disengage from goal pursuits (see Klinger, 1975). It would appear that individuals with a maladaptive motivational structure lack the skills that would enable them to actively achieve goals through resolving problematic life concerns, because they cannot refocus attention on the real problems in their lives. Therefore, these individuals might rely on their use of alcohol to cope with life's problems because they cannot resolve concerns (Cox & Klinger, 2002).

The motivational model of alcohol use predicts that a drinker will be more likely to drink alcohol if he or she is unmotivated to change behaviour and has a maladaptive motivational structure. Furthermore, a drinker's maladaptive motivational structure prevents him or her from focusing on adaptive rewarding incentives or goal pursuits that are an alternative source of reinforcement from drinking alcohol (Cox, Pothos, & Hosier, 2007).

Relationship Between Motivational Structure and RST

Motivational structure for some people might be more of a state-like process and for others' it might be more of a trait-like process, especially if they are more responsive to aversive than appetitive goals or vice versa. When assessing motivational structure, some indices, like commitment, tend to be stable, whereas other indices, such as goal-distance, tend to be unstable. The unstable indices are not considered to be a problem because they represent the changes in motivational structure that the MSQ and PCI are designed to measure (Cox & Klinger, 2004; Sellen, McMurran, Cox, Theodosi, & Klinger, 2006). Motivational structure can be indexed and assessed in many ways; it can be derived from factor analysis (see Hogan, 2005; Hosier, 2001), or from a Value x Expectancy Theory approach (see Cox, Pothos, & Hosier, 2007; Klinger & Cox, 2004), or from structural formulae (see Cook, 2004), or from inappropriate commitment and ambivalence (Cox & Klinger, 2004). For example, ambivalence is calculated by taking into account the respondent's reported 'Happiness' and 'Unhappiness' ratings for each personal concern. Ambivalence scores tend to increase as the discrepancies between these ratings decrease. Higher scores on this MSQ-derived index indicate that the respondents are ambivalent about a goal because they do not expect to gain emotional

satisfaction from achieving it. The next study presented in this thesis employed structural formulas derived from the relationships between the SPSRQ scores and averaged PCI indices to calculate indices for avoidance and approach motivational structure.

At a conceptual and theoretical level, it can be argued that RST personality constructs may shape goal-setting and motivational structure to some degree, even though personality per se is considered to be a distal predictor of alcohol use in Cox and Klinger's model (see Chapter 2). The justification for expecting RST personality constructs to shape motivational structure comes from research on approach (BAS or E driven) and avoidance (BIS or N driven) goal-directed behaviours. These research findings are reviewed in the following section; before this, the possible connections between RST concepts and motivational structure are further explained with reference to personal goals and self-regulation processes.

Personal Goals and Self-Regulation

The view that personal goals are an important aspect of motivation is a salient point in Cox and Klinger's model of alcohol use, where the setting and attainment of personal goals is considered to be a fundamental factor for an adaptive motivational structure and possibly a drinker's decision not to drink. Research has found that decreasing people's motivation to obtain non-alcohol related incentives increases the motivation to drink (Vuchinich & Tucker, 1996). Likewise, Man et al. (1998) found that alcohol abusers had 40% fewer goals than non-alcohol abusing students. Having personal goals can be viewed as giving meaning to a person's life (Dickson, 2006). Sheldon and Elliot (1999) proposed that personal goals represent people's attempts to achieve new levels of positive adaptation, self-discovery, and psychological well-

being. Consequently, how the BAS and BIS drive goal-orientated behaviours is central to any debate on how people generate, formalise, and attain personal goals that enable them to manage their psychological well-being.

If one takes the view that goals are mental representations of desired outcomes, then they must be associated with self-regulatory processes (Heller, Komar, & Lee, 2007). Self-regulation refers to the processes by which people manage their goal-directed behaviours in the absence of immediate external constraints (see Bandura, 1977; Kirschenbaum, 1987). Self-regulation can be said to involve interactions between cognitions, actions or behaviours, physiology (e.g., BIS/BAS/FFFS), affective states, and intrinsic or extrinsic constraints. Carver and Scheier (1981) posited that self-regulation involves goal-setting and related processes such as expectancies and plans, the self-monitoring of behaviour, and observing performance relative to attaining the goal (self-evaluation). Furthermore, any discrepancy between the desired and current state of the goal directs or guides behaviour, actions, and efforts to attain the goal (Bandura, 1991). This might be how an adaptive motivational structure facilitates movements toward the goal and a maladaptive motivational structure hinders movements toward the goal or facilitates movements away from the goal in Cox and Klinger's model. The self-regulation of goal-setting and attainment processes can fail for a number of reasons, such as difficulties coping with emotional problems or excessive drinking. A dysregulated overactive BAS can cause self-regulatory behaviours to fail because the person responds in an exaggerated approach manner. Self-regulatory process can also fail in individuals with a weak BIS, because they do not have the ability to resist cues and urges (an inhibition deficit).

Personal goals can be separated into approach (get, or achieve, or maintain in Cox and Klinger's model) and avoidance (get rid of, or prevent, or avoid in Cox and Klinger's model) categories. Approach goals can be defined as trying to move towards or maintain desirable outcomes and avoidance goals can be defined as trying to move away from or stay away from undesirable outcomes (Elliot, Sheldon, & Church, 1997). Approach and avoidance goals differ in the incentive valence attached to them (positive and negative, respectively). Approach goals are associated with the pursuit of a positive end-state and avoidance goals are associated with the avoidance of a negative end-state. In the RST framework, the BAS drives approach goal-pursuit cognitions, affective responses, and actions, and the BIS drives avoidance goal-pursuit cognitions, affective responses, and actions. Approach and avoidance goals can evoke different affective, cognitive, and behavioural responses (Elliot & Church, 1997). Hence, two biologically based personality, emotion, and motivation systems that respond to either approach goal-pursuit stimuli (BAS) or avoidance goal-pursuit stimuli (BIS) probably have the ability to directly or indirectly shape goal-setting behaviours and motivational structure, if motivational structure represents a person's cognitions, affective responses, and behavioural actions to reach a desired end-state. For example, people with a BIS+ predisposition may be more likely to have a maladaptive motivational structure because they have more problems resolving concerns and disengaging from inappropriate or unrealistic concerns. They may also appraise approach or avoidance goals as being threatening because they lack the resources or skills and cognitions to resolve or achieve them (maladaptive motivational structure). Hence, a drinker with an overactive BIS and maladaptive motivational structure might drink alcohol to cope with life problems. Furthermore, such a person might have more avoidance goals, and fewer appetitive goals, or more

goals overall. Having too many personal goals might also be a problem, because a person might be taking on more than he or she can cope with, or lacks the resources and skills to deal with such a large number of unresolved personal goals.

Research Relating RST to Goal-Directed Behaviours

Research into BIS sensitivities, negative affect, and life events has found that BIS+ participants had higher negative affect scores than BAS+ participants. There was no evidence to suggest that BIS+ participants were avoiding negative life events, but they were characterised by higher sensitivities for the occurrence of such events (Gable, Reis, & Elliot, 2003). Thus, BIS sensitivities appear to be associated with greater reactivity to negative than positive life events. Magnus, Diener, Fujita, and Pavot (1993) found that E predisposed that participants would experience more objectively rated positive events, whereas N predisposed that participants would experience more objectively rated negative events.

In another study, Slessareva and Muraven (2004) proposed that self-control can be viewed as a form of choice behaviour; it can override the urgency for instant gratification, in encounters with environmental stimuli, by maintaining the pursuit of distant goals (goal-engagement). The breakdown in intrinsic goal-striving is reported to be the primary mechanism facilitating impulsivity and disinhibition by enhancing the saliency of extrinsic environmentally rewarding stimuli. The rewarding qualities of short-term gratification goals (e.g., to drink alcohol) cause the individual to abandon delayed-gratification goals and pursue immediate-gratification goals that yield smaller rewards. By pursuing smaller rewards the individual is attempting to alleviate any negative affect, which is activated and initiated by the BIS or BAS. This

form of unhealthy motivational self-regulation can drive behaviour (Muraven & Slessareva, 2003; Slessareva & Muraven, 2004).

In a number of studies, Dickson and colleagues have consistently found relationships between measures of BIS responsivity and avoidance goal-directed behaviours (Dickson, 2006; Dickson & MacLeod, 2004a, 2004b, 2006). For example, anxious participants (BIS+) were found to generate more avoidance goals and more negative consequence steps in response to non-attainment of goals (irrespective of goal type), than non-anxious participants (BIS-). No differences were found between BIS+ and BIS- participants on number of approach goals or positive consequence steps in response to goal attainment (irrespective of goal type). Goals were defined as future experiences that respondents were typically trying to accomplish or avoid (Dickson, 2006). Dickson concluded that anxiety is marked by both passive and active avoidance and that an anxious individual's goal-systems are activated by heightened avoidance but not approach motivation.

Theoretical Predictions Regarding RST and Motivational Structure

It can be theoretically and conceptually proposed that both RST personality constructs and motivational structure are able to regulate goal-directed cognitions, affective states, motivation, control beliefs, and actions. If this proposal is correct then an avoidance or approach motivational structure may be a better predictor of alcohol use than either personality or motivational structure alone.

Alcohol Use Motives

Like motives for not drinking or abstaining, alcohol use motives were derived from Cox and Klinger's motivational model of alcohol use. Motives are defined as conscious or unconscious reasons for behaviour that direct a person's energies towards a goal (e.g., to drink alcohol; Cooper, 1994; Cox & Klinger, 1988, 2004; Kuntsche, Knibbe, Gmel, & Engels, 2005). According to the motivational model (see Chapter 2), people make choices and decisions about whether to drink or not to drink, whenever the positive consequences outweigh the negative consequences their decision will be to drink.

Cooper (1994) proposed a model of drinking motives that crossed Cox and Klinger's valence (positive or negative) and source (internal or external) constructs of the outcomes a person expects to gain from drinking. Cooper proposed four types of alcohol use motives by crossing the source and valence constructs, enhancement alcohol use motives (internally generated positive reinforcement motives), social alcohol use motives (externally generated positive reinforcement motives), coping alcohol use motives (internally generated negative reinforcement motives), and conformity alcohol use motives (externally generated negative reinforcement motives).

As Cox and Klinger (2004) indicate, Cooper's definition of alcohol use motives is a slight misinterpretation of the tenets of the motivational model of alcohol use (as described in Chapter 2). According to Cox and Klinger's model, alcohol use motives are determined by crossing the valence (positive or negative) of the affective change with the direct (pharmacological) or indirect (instrumental) effects of the affective change. So, enhancing positive affect instrumentally is broader than Cooper's account of social alcohol use motives. Lecci, MacLean, and Croteau (2002,

p. 620) describe Cooper's alcohol use motives as a nomothetic approach for understanding and quantifying alcohol-specific motives. Nomothetic motives are a broad class of goals that are common to everyone and target a specific outcome. Thus, alcohol use motives are assessed and volume of alcohol consumption is the targeted specific outcome. Cooper's alcohol-specific motives are proximal determinants that form part of the final pathway to alcohol use (Cox & Klinger, 1988, 2004).

Overall, alcohol use motives are based on the premise that people may drink in order to attain certain valued outcomes (Cooper, 1994; Cox & Klinger, 1988, 2004; Kuntsche et al., 2005). This premise assumes that peoples' alcohol use is motivated by a variety of needs and desires and serves many different functions (e.g., reducing stress in anxiety-prone people). Internal alcohol use motives (coping and enhancement) are presumed to reflect drinkers' internal needs, which are constant across situations and associated with specific personality types (Cooper, 1994; Stewart, Loughlin, & Rhyno, 2001).

Relationship Between Alcohol Use Motives and RST

Kuntsche and colleagues undertook a review of the literature and found consistent associations between enhancement alcohol use motives and extroversion or sensation-seeking and coping alcohol use motives and neuroticism or anxiety or anxiety-sensitivity (Kuntsche, Knibbe, Gmel, & Engels, 2006a).

Anxiety-sensitivity is the predisposition to fear anxiety-related sensations, arising from beliefs that anxiety-related symptoms can lead to disastrous physical, emotional, or social effects (Peterson & Reiss 1992; Reiss, Peterson, Gursky, & McNally, 1986). Stewart and Zeitlin (1995) noted that high levels of anxiety-sensitivity are associated with coping alcohol use motives, because they

maladaptively help a person to alleviate negative emotional states. They also report that the relationship between anxiety-sensitivity and coping alcohol use motives were stronger for female than male college students. It has been proposed that anxiety-sensitive people drink alcohol for its anxiolytic properties, which in turn helps them to maladaptively regulate aversive inner states (Stewart, Karp, Pihl, & Peterson, 1997). Novak and colleagues investigated self-reported motives for alcohol and nicotine use and levels of consumption; they found that anxiety-sensitivity was directly associated with coping alcohol use motives, but they proposed that anxiety-sensitivity is probably a better predictor of coping alcohol use motives than volume of alcohol consumed (Novak, Burgess, Clark, Zvolensky, & Brown, 2003). This premise indicates that anxiety-sensitivity, like other personality constructs, is a distal predictor of alcohol use that is mediated by more proximal determinants.

Anxiety-sensitivity is comparable to the normal functions of the BIS or FFFS or BIS/FFFS combined, and shares a great deal of common variance with neuroticism in Eysenck's theory. Neuroticism has been defined as emotional liability, hypersensitivity to criticism, self-doubt, and the tendency to dwell on negative events (e.g., Cooper, Agocha, & Sheldon, 2000). Dwelling on negative events is sometimes termed depressive-rumination and is associated with a myriad of disorders (e.g., anxiety and binge-drinking). Theoretically and conceptually it can be proposed that coping alcohol use motives serve the same function in people with an overactive BIS. That is, they drink alcohol for its anxiolytic properties as a means to maladaptively regulate negative emotional states resulting from internal or external stimuli.

In other studies, enhancement and coping alcohol use motives were found to be positively associated with alcohol consumption; coping alcohol use motives predicted alcohol-related problems in adolescents and both were associated with

heavy drinking patterns (Cooper et al., 2000; Cooper, Frone, Russell, & Mudar, 1995; Stritzke & Butt, 2001).

Drinking to enhance positive emotional states tends to be associated with Eysenck's extroversion or Zuckerman's sensation seeking (the desire for intense and novel situations that are personally rewarding). In the same manner as the BIS, it can be proposed that enhancement alcohol use motives serve the same function in people with an overactive BAS, because they are more sensitive to positive affective stimuli (Gray, 1982). However, coping alcohol use motives might also serve a secondary purpose in people with an overactive BAS. Research on Whiteside and Lynam's four-dimensional model of impulsivity found that urgency scores were positively associated with alcohol use. Urgency is the tendency to act rashly in response to distress.⁴ Urgency scores are the best predictors of drug and alcohol use in individuals who are substance dependent (Verdejo-Garcia, Bechara, Recknor, & Perez-Garcia, 2007). Coping alcohol use motives for people with an overactive BAS might serve many functions, such as acting as secondary reinforcers, helping them to regulate the impact of internal or external aversive stimuli and deal with the negative consequences of rash or impulsive motivation, desires, urges, cognitions, emotions, decisions, and actions. It can be proposed that for people with an overactive BAS, enhancement and coping alcohol use motives might internally motivate the final decision to drink because they yield different rewards (e.g., positive and negative incentives or reinforcement, respectively).

⁴ Cyders and Smith (2007) provide definitions for positive and negative urgency.

Theoretical Predictions Regarding RST and Alcohol Use Motives

In general, people who are internally motivated to use alcohol tend to report more alcohol consumption on measures of drinking than those who are externally motivated to use alcohol (see Karwacki & Bradley, 1996; Weinberger & Bartholomew, 1996). Findings for externally motivated social and conformity alcohol use motives show less consistency across situations and with specific personality types than internally motivated coping and enhancement alcohol use motives (Kuntsche et al., 2006a). Some specific predictions regarding possible associations between BIS and BAS activation and alcohol use motives are outlined in the previous section. More generally, if personality constructs are assessed then it is also advisable to assess alcohol-specific motives. This is because, according to Cox and Klinger's model, personality constructs work through more proximal determinants of alcohol use, such as alcohol-specific motives.

Motives for Abstaining from Alcohol

Very few published studies have investigated students' motives for not drinking (see Demone, 1973; Greenfield, Guydish, & Temple, 1989; Johnson & Cohen, 2004; Moore & Weiss, 1995; Reeves & Draper, 1984; Slicker, 1997); in fact, no published studies have investigated drinking motives and motives for abstaining from alcohol in the same sample. The majority of the early work was undertaken with alcoholics in treatment or those attending Alcoholics Anonymous (AA), abstinent alcoholics, or children of alcoholics (e.g., Amodeo, Kurtz, & Kutter, 1992; Amodeo & Kurtz, 1998; Hesselbrock, O'Brien, Weinstein, & Carter-Menendez, 1987; Johnson, Schwitters, Wilson, Naghoshi, & McClearn, 1985).

Reasons, motives, and expectancies are well established determinants of drinking behaviour, but if excessive drinkers are expected to control, reduce, or stop their unhealthy patterns of alcohol use they need to have motives for not drinking that are incongruent with their reasons, motives, and expectancies for drinking. Motives for drinking tend to be associated with higher volumes of alcohol consumption and more alcohol-related problems, whereas motives for not drinking tend to be negative predictors of excessive drinking and can play a crucial role in prevention, intervention, and treatment programmes if they help to facilitate adaptive behavioural changes (e.g., reduced volumes of alcohol consumption). They probably will not help with restrained drinking patterns, which tend to be positive predictors of alcohol use and alcohol related problems, because restrained drinkers tend to engage in bouts of uncontrolled binge drinking (Stewart & Chambers, 2000).

Like alcohol use motives, motives for abstaining from alcohol are derived from Cox and Klinger's motivational model of alcohol use. As described in Chapter 2, people make choices and decisions about whether to drink or not to drink and whenever the negative consequences outweigh the positive consequences their decision will be to not drink. Stritzke and Butt (2001, p. 636) focused on three components of Cox and Klinger's (1988) model to develop the Motives for Abstaining from Alcohol Questionnaire (MAAQ). The first component addressed by Stritzke and Butt were from past drinking experiences: (1) biochemical reactions to alcohol, (2) sociocultural and environmental factors such as religion, and (3) past drinking experiences such as the embarrassment associated with drunken behaviours.

The second component addressed by Stritzke and Butt concerned current factors: (1) situational factors such as other people discouraging the use of alcohol, and (2) the availability of other sources of reinforcement such as incentives and life-

goals that reduce the incentive value of alcohol and enhance indifference toward drinking. The third component addressed by Stritzke and Butt was from the domain of cognitive mediators of the final decision not to drink, in the form of expected negative consequences following the consumption of alcohol. Stritzke and Butt excluded personality and learned cognitive and conditioned reactions to alcohol from the development of the MAAQ, because they were not interested in how these determinants drive the final decision to not drink. Negative consequences were found to be the best negative predictor of alcohol consumption, and indifference and family constraints were found to be the best negative predictors of frequency of drinking. No relationships were found between either dispositional risk or religious constraints and measures of alcohol use.

Theoretical Predictions Regarding RST and Motives for Abstaining from Alcohol

No published studies have examined the relationship between motives for abstaining from alcohol and RST. At a theoretical and conceptual level it can be proposed that a person with an overactive BIS would be more susceptible to the negative consequences of excessive alcohol consumption and score higher on MAAQ negative consequences as a motive for abstaining. In a similar manner, a person with an overactive BAS should be more susceptible to the personal risks associated with excessive alcohol consumption (e.g., alcohol-related problems) and score higher on the MAAQ dispositional risk factor as a motive for abstaining. In agreement with Cox and Klinger's model, motives for abstaining from alcohol are proximal determinants of alcohol use, although it can be argued that dispositional risk motives are a distal determinant of alcohol use, because they are derived from past drinking experiences.

Negative consequences and dispositional risk motives might mediate the relationship between personality and volume of alcohol consumed.

Summary and Conclusions

The present chapter highlights the associations between the putative proximal and distal determinants of alcohol use within Cox and Klinger's framework. The determinants are selected from diverse but interrelated areas of RST and addictive behaviours research. This chapter integrates the findings from the published literature and clarifies the role of individual differences in personality, coping behaviour, control beliefs (realistic and unrealistic), emotional regulation, motivational structure and goal-setting, alcohol use motives, and motives for abstaining from alcohol within a multidimensional model of alcohol use.

Consistent with Cox and Klinger's model, three constructs are deemed to be distal determinants of alcohol use: (1) personality, assessed as BIS and BAS sensitivities, (2) coping behaviour, and (3) realistic and unrealistic control beliefs. Four constructs are deemed to be proximal determinants of alcohol use: (1) emotional regulation, (2) motivational structure, (3) alcohol use motives, and (4) motives for abstaining from alcohol. The distal determinants will be directly but weakly associated with volume of alcohol consumed and the proximal determinants will partially mediate these relationships. Only part of the distal determinants will have an effect through the proximal determinants of alcohol use. Figure 4.3 illustrates the relationships between the putative determinants of alcohol consumption reviewed in this chapter within Cox and Klinger's motivational model of alcohol use.

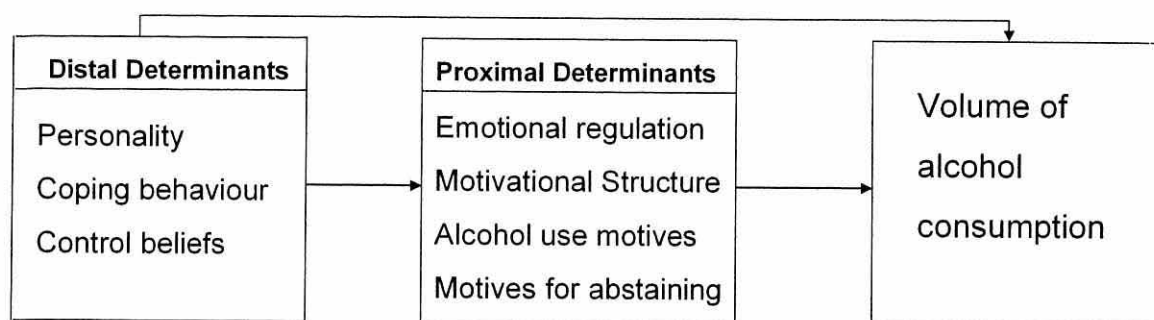


Figure 4.3. The relationship between the proximal and distal determinants of alcohol consumption within Cox and Klinger's motivational model of alcohol use.

The next study in this thesis had been designed to establish the relationships between the variables described in this chapter and students' self-reported alcohol consumption. Study 2 is presented in Chapter 5, following a brief review of the existing motivational structure literature.

CHAPTER 5

Study 2:

Motivational Determinants of Students' Drinking

This chapter presents the second correlational study in this thesis. Study 2 was designed to explore the relationships between the distal and proximal determinants of alcohol use, and identify how drinking motives and motives for abstaining are related to each other, and drinking. First, an overview of the results from studies of motivational structure and alcohol use is presented, followed by an overview of the two motivational pathways to alcohol use derived from Cox and Klinger's multidimensional framework.

Motivational Structure and Alcohol Use

The relationships between motivational structure and alcohol use have been established in clinical, "normal", and student samples. Cox, Blount, Bair, and Hosier (2000) investigated the relationships between readiness to change (RTC) and motivational structure in a clinical sample of 77 inpatients at a detoxification and rehabilitation centre for alcohol dependence. They found that adaptive motivational structure was a positive predictor of determination to change (Cox et al., 2000). People with an adaptive motivational structure are said to be engaged in their goal pursuits, whereas people with a maladaptive motivational structure are said to be less engaged in their goal pursuits (Cox & Klinger, 2004). In an earlier study that used the Motivational Structure Questionnaire (MSQ), Klinger and Cox (1986) found that the

motivational structure of 53 inpatients at a treatment centre moderately predicted their response to treatment. This pattern of results was replicated in a later study with a clinical sample of 202 alcoholic veterans. The alcoholic veterans were followed up 12-months after undergoing a 30-day detoxification and treatment programme. Once again, adaptive motivational structure predicted a more positive treatment outcome (Glasner, Cox, Klinger, & Parish, 2001).

From the studies reviewed so far, it can be concluded that adaptive motivational structure is a good predictor of both a dependent drinker's determination to change and treatment outcome, whereas maladaptive motivational structure is more associated with resistance to change and a worse treatment outcome. A similar pattern of results was found for cognitive (alcohol attentional bias; AAB) and motivational predictors (motivational structure and Readiness To Change) of excessive drinking in a non-clinical sample of 158 excessive drinkers (Cox, Pothos, & Hosier, 2007). The excessive drinkers were tested at baseline and were retested 3 and 6 months later. Cox et al. (2007) found that: (1) high RTC predicted short-term reductions in excessive drinking, (2) low AAB and high family history of alcohol-related problems predicted long-term reductions in excessive drinking, and (3) motivational structure interacted with AAB and RTC; the greatest long-term reductions in excessive drinking were found among participants with an adaptive motivational structure and low AAB and participants with an adaptive motivational structure and high RTC. Hence, cognitive (AAB) and motivational factors (motivational structure and RTC) predicted long-term reductions in alcohol consumption.

The relationships between motivational structure, alcohol consumption, and alcohol-related problems have also been established in students. Cox and colleagues tested 370 students in four countries: the Czech Republic, Norway, the Netherlands,

and the United States (Cox, Schippers, Klinger, Skutle, Stuchikova, Man, King, & Inderhaug, 2002). They hypothesised that adaptive motivational structure would be associated with lower alcohol consumption. Although this hypothesis was not supported, they found an important interaction between adaptive motivational structure and alcohol-related problems among the sample. As students' alcohol-related problems increased, the strength of the negative relationship between adaptive motivational structure and alcohol consumption also increased; in other words, it would appear that as alcohol-related problems and alcohol consumption increased, students' adaptive motivational structure decreased. This study was the first to establish the cross-cultural stability of motivational structure; no significant differences were found across the countries for students' motivational structure.

Similar studies with students have used the Personal Concerns Inventory (PCI) to establish the relations between motivational structure, alcohol use, and alcohol-related problems. Fadardi (2004) found that maladaptive motivational structure and alcohol consumption were positively related, and Hosier (2001) showed that maladaptive motivational structure predicted alcohol-related problems. Hogan (2005) found that adaptive motivational structure and alcohol-related problems were negatively related. That is, as the number of alcohol-related problems reported by students increased, their adaptive motivational structure decreased. Hogan's findings are therefore consistent with those reported by Cox et al. (2002).

Aims of Study Two

The review of the proximal and distal determinants of alcohol use presented in Chapter 4 highlighted the importance of the motivational constructs of Cox and Klinger's model and RST-derived constructs that might drive the final decision to

drink. The personality, emotion, and motivation constructs of RST are seen as being interactive and able to shape behavioural responses to appetitive and aversive incentives, a point that is also central in Cox and Klinger's motivational model of alcohol use.

Study 2 was designed to establish the role of each of the multiple motivational determinants of alcohol use. It was expected to extend the results of Study 1, presented in Chapter 3, which showed that age, age of first drink, and personality predispositions are associated with students' alcohol consumption. More specifically, Study 2 was designed to establish two motivational pathways of alcohol use that were theoretically derived from Cox and Klinger's model, but are mediated by different determinants. The two pathways are based on trait profiles, one for sensitivity to punishment (SP) and the other for sensitivity to reward (SR). These pathways are fully explained below.

Study 2 had four aims: (1) develop formulas for avoidance and approach motivational structure, (2) identify the relationships between the determinants in each motivational pathway, (3) identify the mediators of the relationships between personality and alcohol use in each motivational pathway and predict alcohol consumption for each motivational pathway, and (4) establish the relationships between a measure of drinking motives and motives for abstaining from alcohol. The instruments administered to students in Study 2 are fully described in the Method section. The hypotheses that were tested in Study 2 are presented next.

Hypothesised Motivational Profiles of Alcohol Use

In agreement with Cox and Klinger's model, three constructs were identified as distal predisposition determinants of alcohol use: personality, coping behaviour,

and realistic and unrealistic control beliefs. For example, Cox and Klinger's model includes personality as one of the determinants of alcohol use, and this study is elaborating on this determinant by including other predisposition determinants. The present researcher has included coping behaviour and control beliefs at the same level as personality because they posit that these determinants operate in a dispositional trait manner, rather than a state manner. All the distal determinants were deemed to be past experiences with drinking (see Chapters 2 and 4). Four constructs were identified as proximal motivational determinants of alcohol use: emotional dysregulation, approach and avoidance motivational structure, coping and enhancement alcohol use motives, and negative consequences and dispositional risk motives for abstaining from alcohol. The distal determinants were expected to be directly associated with alcohol use, whereas the proximal determinants were expected to partially mediate these relationships. Figure 5.1 shows the hypothesised relationships between the proximal and distal determinants of alcohol consumption investigated in Study 2. In short, Study 2 is testing RST constructs (e.g., personality, emotion, and motivation) with determinants of alcohol use that were derived from the conceptual framework of Cox and Klinger's model (e.g., drinking for affective change with emotional dysregulation and alcohol use motives).

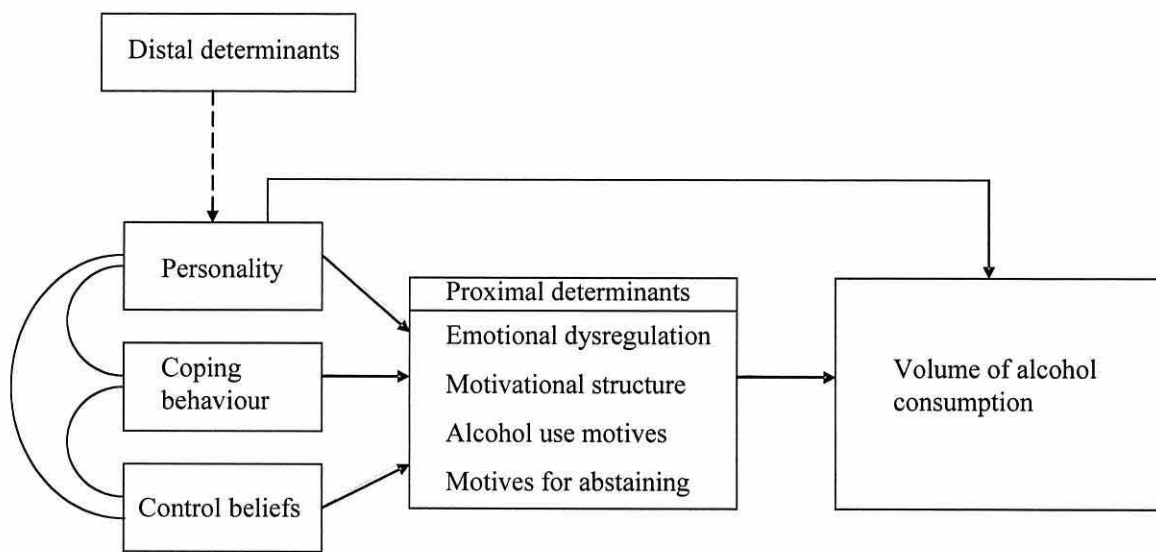


Figure 5.1. The relationships between the proximal and distal determinants of alcohol consumption investigated in Study 2.

Figure 5.1 is a general representation of a motivational pathway that includes several distal and proximal determinants included in Study 2. Next, two specific profiles were designed, one for each personality predisposition. The constructs included in each profile were derived from the theoretical and empirical findings on RST, reviewed in Chapters 2 and 4.

Hypothesised SP Motivational Profile

A drinker with an SP motivational profile is expected to use maladaptive coping behaviours when dealing with stressful situations or problems. Such individuals were expected to have low realistic control beliefs because they perceive themselves as being unable to control the outcomes of controllable life events. They were also expected to have problems regulating their emotions and an avoidance motivational structure, and to drink for coping motives. In other words, it was

hypothesised that the SP motivational pathway leads to risky disinhibited drinking for coping reasons (e.g., negative reinforcement or avoidance motivation). Negative consequences motives for abstaining from alcohol were selected as the best inverse predictor of alcohol use in this pathway because of the association between a BIS+ predisposition and the dislike of punishers or negative consequences.

Mediators of the SP Motivational Pathway

It was predicted that the relationship between SP and alcohol use would be mediated by four proximal motivational determinants: (1) emotional dysregulation, (2) avoidance motivational structure, (3) coping alcohol use motives, and (4) negative consequences motives for abstaining from alcohol.

Hypothesised SR Motivational Profile

A drinker with an SR motivational profile is expected to use maladaptive coping behaviours when dealing with stressful situations and problems; the type of coping is believed to be problem-specific by this researcher (see Chapter 4). Such individuals were expected to score high on unrealistic control beliefs; scoring high on unrealistic control beliefs is a maladaptive behaviour that is associated with reduced problem solving skills. They were also expected to have problems regulating emotions, a maladaptive approach motivational structure, and drink for enhancement alcohol use motives. In other words, it was hypothesised that the SR motivational pathway will be associated with disinhibited risky drinking for either negative or positive reinforcement reasons (avoidance and approach motivation). Dispositional risk motives for abstaining from alcohol were selected as the best inverse predictor of

alcohol consumption in this pathway because it was hypothesised that BAS+ individuals perceive themselves as being at risk of developing or having alcohol misuse problems than BIS+ participants.

Mediators of the SR Motivational Pathway

It was predicted that the relationship between SR and alcohol use would be mediated by four proximal motivational determinants: (1) emotional dysregulation, (2) approach motivational structure, (3) enhancement alcohol use motives, and (4) dispositional risk motives for abstaining from alcohol.

Relationships Between Alcohol Use Motives and Motives for Abstaining

Study 2 was the first to employ a measure of alcohol use motives and a measure of motives for abstaining in the same sample. It was predicted that motives for abstaining from alcohol would be inversely related to alcohol use motives because they form part of the motivational pathway not to drink, whereas alcohol use motives form part of the motivational pathway to drink. These two pathways, described in Cox and Klinger's model, are illustrated in Chapter 2 (see Figure 2.1.).

METHOD

Ethical Approval

The research reported here complied with the BPS ethical guidelines; it was reviewed and approved by the School of Psychology Ethics Committee. Informed consent was obtained from all participants, who were aware of their right to withdraw from the study without penalty (none did so); they were debriefed at the end of the procedure and their questions were answered by the researcher. Personal information that could identify individuals was not recorded on the study materials. Data were kept on a password-protected computer in a locked office. Consent forms and information sheets given to participants are presented in Appendix 7.

Participants

A total of 207 participants from 13 departments at Bangor University were recruited and tested. Participants were recruited through two website advertisements. One was placed on the School of Psychology SONA website, which is used to recruit psychology students. They volunteered as part of a requirement for their degree in psychology and earned 2 course credits and £4 worth of printer credits ($n = 71$). The second advertisement was placed on the Bangor University intranet. Participants who were recruited in this way earned £5 in cash and £4 worth of printer credits ($n = 136$). Each website advertisement stated that, "The research is investigating the relationships between personality and coping behaviour to develop screening and assessment tools for a community based intervention".

A representative cross-sample of university students were recruited to take part in this study. Eighty percent of the sample were female ($n = 164$) and 20% were male ($n = 42$). Eighty-seven percent of the sample were undergraduates ($n = 181$) and 13% ($n = 26$) were postgraduates. Eighty percent of the sample were native English speakers ($n = 166$) and 20% ($n = 41$) were non-native English speakers. All the non-native English speakers had an acceptable standard of English. Eighty-six percent of the sample consumed alcohol on a regular basis ($n = 178$) and 14% ($n = 29$) of the sample were abstainers from alcohol.

Participants' ages ranged between 18 and 35 years for males (median = 21 years) and between 18 and 46 years for females (median = 20).¹ The participants reported having between 12 and 29 years of formal education (median = 15 years). They first drank alcohol between the ages of 9 and 21 (median = 15 years) and have been drinking alcohol on a regular basis for between 0 and 20 years (median = 3 years).

The sample used was not selected on the Department of Health's guidelines for excessive drinking (14-21 units of alcohol per week for females, and 21-28 units per week for males). This allowed the researcher to sample the full range of student drinkers for the study.

¹ Ranges and medians are reported as more appropriate measures of spread and central tendencies, respectively, rather than commonly used standard deviations and means, because the age score distributions were very skewed and kurtosed in the present sample.

Instruments

Participants were asked to complete nine questionnaires. These included a measure of personality, coping, control beliefs, emotional regulation, personal concerns, drinking motives, and motives for abstaining, and drinking patterns. Cronbach's alpha was set at .70 for this study; no scales or sub-scales violated this assumption. Hence, the scales and sub-scales employed in this study were found to be internally consistent and reliable.

Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ)

The SPSRQ (Torrubia et al., 2001) is a 48-item self-report questionnaire that assesses the responsivity of the BIS and BAS systems (see Chapter 3 for a fuller description of this instrument). Torrubia et al. (2001) reported good internal consistencies for the SP and SR scales ($\alpha = .84$ and $\alpha = .76$). The alphas for the SP and SR scales in this study were also found to be good ($\alpha = .84$ and $\alpha = .74$).

Revised-Coping Orientation to Problems Experienced (R-COPE)

The R-COPE (Zuckerman & Cagne, 2003) is a revised version of the Carver, Scheier, and Weintraub (1989) dispositional coping strategies questionnaire. It is a 40-item questionnaire that assesses 5 coping behaviour factors (self-help, approach, accommodation, avoidance, and self-punishment). Each factor in the questionnaire is represented by 8 items. Self-help coping behaviours are considered to be adaptive emotional coping behaviours. Approach and accommodation coping behaviours are considered to be adaptive coping behaviours because they allow people to actively deal with the stressor or problem, or come-to-terms with the adversity by accepting

that they cannot do anything to resolve the problem. Avoidance coping behaviours are considered to be maladaptive because they allow people to avoid dealing with the problem or stressor. Self-punishment coping is another maladaptive coping behaviour that allows people to ruminate over the problem, rather than finding adaptive strategies to deal with the stressor or problem.

Respondents rate the relative frequency with which they use the strategies described in each item when under stress, on a 4-point scale, ranging from 1 (I usually don't do this at all) to 4 (I usually do this a lot). Scores are calculated for each coping factor by summing the relevant items. A sample R-COPE questionnaire is presented in Appendix 8.

Zuckerman et al. (2003) reported good internal consistency scores for the R-COPE factors; alphas ranged from .81 to .92. Four R-COPE factors (self-help, approach, avoidance, and self-punishment coping) were used in this study. The alphas for the four factors were also found to be good in this study ($\alpha = .90, .85, .70$, and $.83$, respectively). The remaining factor, accommodation coping, had not been used in this study because it had no relevance to the study predictions.

Realistic and Unrealistic Control Belief Scales (RAUCB)

The RAUCB (Zuckerman et al., 2004) is a 42-item self-report questionnaire that contains 21 items to assess realistic control beliefs and 21 items to assess unrealistic control beliefs. Realistic control belief is the expectancy that a person can influence or control the outcome of a situation that is controllable, whereas unrealistic control belief is the expectancy that a person can influence or control the outcome of a situation that is in fact uncontrollable (Zuckerman et al., 2004). Realistic control belief statements are addressed by the even numbered items and unrealistic control

belief statements are addressed by the odd numbered items. “If I try very hard, most of my plans will work out” and, “Some tasks in life require abilities that I do not have” are sample realistic and unrealistic control belief items, respectively.

Respondents rate the relative frequency with which the statements in each item apply to them on a 7-point scale, ranging from 1 (agree) to 7 (disagree). Scale scores are calculated by summing the relevant items after reverse-scoring the negatively keyed items. The total raw score for each scale is then divided by the total number of items on that scale to give an index for realistic and unrealistic control beliefs. The RAUCB questionnaire is presented in Appendix 9.

Zuckerman et al. (2004) reported good internal consistency scores for the realistic and unrealistic control belief scales ($\alpha = .79$ and $.77$). The alphas for the two control beliefs scales were also found to be good in the current study ($\alpha = .81$ and $.80$, respectively).

Difficulties in Emotion Regulation Scale (DERS)

The DERS (Gratz & Roemer, 2004) is a 36-item self-report questionnaire that assesses emotion dysregulation (the failure to regulate negative emotions), which may lead to maladaptive behaviours, such as substance abuse. Emotion regulation can be categorised into: (a) awareness and understanding of emotions, (b) acceptance of emotions, (c) ability to engage in goal-directed behaviours whilst refraining from impulsive behaviours during negative emotional experiences, (d) access to effective emotion regulation strategies, and (e) attempts to measure the use of situationally appropriate strategies which aid the modulation of emotional responses (Gratz & Roemer, 2004).

The five concepts of emotion regulation are assessed by six DERS subscales. “When I’m upset, I take time to figure out what I’m really feeling” and “When I’m upset, I feel guilty for feeling that way” are sample lack of emotional awareness and nonacceptance of emotional responses items, respectively. “When I’m upset, I have difficulty getting work done” and “When I’m upset, I have difficulty controlling my behaviours” are sample difficulties engaging in goal-directed behaviour and impulse control difficulties items, respectively. “When I’m upset, I believe that wallowing in it is all I can do” and “I have no idea how I am feeling” are sample limited accesses to emotion regulation strategies and lack of emotional clarity items, respectively.

Respondents rate the relative frequency with which the statements in each item apply to them on a 5-point scale, ranging from 1 (almost never) to 5 (almost always). Subscale scores are calculated by summing the relevant items after reverse-scoring the negatively keyed items. The DERS questionnaire is presented in Appendix 10.

Gratz and Roemer (2004) reported good internal consistency scores for the DERS scales, alphas ranged from .80 to .89. Three DERS scales (nonacceptance, impulse, and goals) were used in this study. The alphas for the three scales were also found to be good in this study ($\alpha = .91, .89, \text{ and } .89$, respectively). The remaining three scales have not been used in this study because they had no relevance to the study predictions.

Research Version of the Personal Concerns Inventory (R-PCI)

The Personal Concerns Inventory (PCI) was developed within the framework of the motivational model of alcohol use (Cox & Klinger, 1988, 1990, 2002, 2004) and is an abridged version of the Motivational Structure Questionnaire (MSQ; Klinger, Cox, & Blount, 1995). The present study used the R-PCI, which was

developed to be a brief version of the PCI by Fadardi and Cox (2003). On the PCI, respondents state their current concern(s) and their desired goal for each life area, but on the R-PCI respondents state whether they have a current concern in each life area or not. The eight life areas listed on the questionnaire are: (1) Home and Household Matters, (2) Relationships, (3) Love, Intimacy and Sexual Matters, (4) Self-Changes, (5) Finance and Employment, (6) Leisure and Recreation, (7) Health and Medical Matters, and (8) Education and Training. These life areas represent the most common areas of life usually highlighted by participants (Fadardi, 2004).

After respondents have decided whether they have a concern for a life area, they rate their goal striving behaviours for that concern on 10 rating scales. Each rating scale has two fixed anchors, 0 (zero) being the least amount and 10 being the greatest amount. The first scale rated is the action scale for resolving the concern; this can be either appetitive action (something that respondents want to get, obtain, or accomplish) or aversive action (something that respondents want to get rid of, prevent, or avoid). The remaining scales are: How likely (chances of success), How much control (over achieving the goal), Do I know what to do (how to go about achieving the goal), If I try my best (hope about achieving the goal), How happy (joy from achieving the goal), How committed (to goal pursuit and attainment), How long (distance from goal achievement), and How sad (sorrow if they do not achieve the goal).

Scores on each of the 10-rating scales for each life area were summed to produce a total score, which was then divided by the number of life areas the participant reported having a concern in, to produce an average rating for each scale. In total, 10 averaged indices were derived from the R-PCI. The indices were correlated with the SP and SR scores to produce a motivational structure formula for

each respondent. A sample R-PCI questionnaire is presented in Appendix 11. The internal consistency of the R-PCI was calculated by Fadardi (2004), who concluded that the inventory provides consistent scores for respondents' perceptions of their goal directed behaviours.

Drinking Motives Questionnaire - Revised (DMQ-R)

The DMQ-R (Cooper, 1994) is a 20-item self-report questionnaire that assesses four alcohol use motives (social, enhancement, coping, and conformity). "To be sociable" and "Because you like the feeling" are sample social and enhancement items, respectively. "To forget your worries" and "To be liked" are sample coping and conformity items, respectively.

Respondents rate how often they are motivated to drink for various reasons on a five-point scale, ranging from 1 (almost never/never) to 5 (almost always/always). Scale scores for each of the four alcohol use motives are computed by averaging the scorers across the five items on each scale. The DMQ-R questionnaire is presented in Appendix 12.

Cooper (1994) reported good internal consistency scores for the DMQ-R scales, the alphas ranged from .85 to .88. Two internal alcohol use motives (coping and enhancement) were used in this study. The alphas for the two alcohol use motives scores were found to be good in this study ($\alpha = .85$ for both motives). The remaining two external motives have not been used in this study because they had no relevance to the study predictions.

Motives for Abstaining from Alcohol Questionnaire (MAAQ)

Cox and Klinger (1988) proposed that effective treatment programmes should address the cognitive-affective-motivational determinants of the decision not to drink, if they are to have successful outcomes (e.g., reduced drinking or abstinence alongside the development of non-alcohol related life incentives). This is what the MAAQ was designed to assess by Stritzke and Butt (2001).

The MAAQ is 19-item self-report questionnaire that assess five motives for not drinking alcoholic beverages (fear of negative consequences, dispositional risk, family constraints, religious constraints, and indifference). “Alcohol impairs peoples’ control of themselves” and “I have or used to have a drinking problem” are sample fear of negative consequences and dispositional risk items, respectively. “My family gets upset when I drink” and “Drinking alcohol is against my spiritual and religious beliefs” are sample family and religious constraints, respectively. “I have no desire to drink alcohol” is a sample indifference item.

Respondents rate how important each reason for not drinking on a particular occasion or for not drinking at all is on a five-point scale, ranging from 0 (not at all important) to 4 (extremely important). Scale scores are computed by averaging the scorers across the items on that scale. A sample MAAQ questionnaire is presented in Appendix 13.

Stritzke and Butt (2001) reported good internal consistency scores for the MAAQ and its scales, the alphas ranged from .72 to .87 for the scales, and .88 for the total scale. Two internal-MAAQ motives (fear of negative consequences and dispositional risk) were used in this study. The alphas for the two-MAAQ motives scales were found to be good in this study ($\alpha = .77$ and $.94$, respectively). The

remaining three motives for abstaining from alcohol factor were not used in this study because they had no relevance to the study predictions.

Typical and Atypical Drinking Diary

Hogan (2005) designed the Typical and Atypical Drinking Diary (TADD) to be a measure of drinking behaviour that incorporates components of retrospective diaries and quantity x frequency (QF) instruments (see Hogan, 2005). The TADD is a retrospective measure because it is used to record daily drinking for a specific period of time, previous 3-months in this study. Likewise, the TADD is also a quantity x frequency measure because it is used to record daily consumption (quantity) and how often someone drinks (frequency). These components are addressed in two self-reported drinking diaries, one for a typical week and one for an atypical week. The typical weekly diary is used by the participant to record his or her usual pattern of drinking, whereas the atypical dairy is used by the participant to record his or her heaviest or lightest pattern of drinking. A sample TADD questionnaire is presented in Appendix 14.

Respondents record the amount of alcohol consumed for each week day by stating the type of beverage consumed, the alcohol content of the beverage (if known) and the container size (e.g., a glass of wine or a pint of beer). They then indicate how often the typical and atypical patterns of drinking have occurred in the last 12 weeks. One index of participants' drinking behaviour was assessed with the TADD in this study; total alcohol units consumed within the last 12 weeks (termed alcohol consumption scores).

Demographics Questionnaire

On the demographic questionnaire, participants were asked to state their gender, age, total number of years in education, age of first drink (AFD), and how many years they had been drinking alcohol on a regular basis. In addition to these, the questionnaire asked participants to state whether or not they participated in Study 1. This allowed test-retest reliability calculations to be performed on the SPSRQ scores for those participants who participated in Studies 1 and 2. A sample demographics questionnaire is given in Appendix 15.

Procedure

Upon their arrival, participants received an information sheet and were verbally informed that the study was investigating the relationships between personality and coping behaviour. Once participants gave their verbal and written informed consent, they received and completed a questionnaire packet containing nine questionnaires and a demographics sheet: the SPSRQ, R-COPE, RAUCB, DERS, R-PCI, DMQ-R, MAAQ, and TADD. The order of the measures in each questionnaire packet was predetermined by the researcher to control for any order effects (counterbalanced). The abstainers from alcohol were verbally informed that they did not need to complete the MAAQ and TADD. Participants were verbally informed that each questionnaire contains instructions for its completion; if you do not understand the instructions, or have any other questions please ask for assistance. Questionnaires were completed in a quiet research room, in single or group (up to ten participants) testing sessions. Sessions lasted between 60 and 90 minutes, and the researcher was available at all times to deal with any queries. After completing the questionnaires,

each participant was verbally debriefed and given a debriefing sheet (see Appendix 16). Participants were given a full verbal explanation of the procedures employed and were able to ask questions. Participants were then paid, thanked, and discharged from the study with the knowledge that they could contact the researcher later if they had further questions.

Plan of Analysis

Participants' responses on the questionnaires were scored and their data were entered into a spreadsheet; the statistical package SPSS was used for all analyses, unless stated otherwise. The mediational analyses were performed with MedGraph.

Descriptive Analyses and Data Transformations

Descriptive statistics were calculated to establish that the data from the sample were normally distributed. Four demographic indices were found to be non-normally distributed by being skewed and kurtosed (age, total number of years in education, age of first drink, and how many years they had been drinking alcohol on a regular basis). These indices were then normalised through area transformations with the Rankit procedure. No variables were found to violate the assumptions for normality after being transformed with the Rankit procedure (see Chapter 3).

Significance Testing

Pearson correlations were used to identify significant relationships between the demographic variables and participants' alcohol consumption. These correlations

also allowed the researcher to identify any variables that needed to be controlled in Step 1 of the regression analysis.

Two-tailed, independent samples t-tests were used to establish if there were any significant differences among the independent variables that were attributable to sample characteristics (e.g., gender or nationality). The accompanying Levene's test was used to identify any violations of homogeneity of variance. Homogeneity of variance was violated for one test (nationality differences on alcohol consumption scores). Cohen's *d* measure of effect size was used to identify the magnitude of the differences between the means. These tests identified any variables that needed to be controlled for in Step 1 of the regression analysis.

Next, Pearson correlations were run to establish the associations among the PCI indices before deriving personality based formulae for motivational structure. Formulae for avoidance and approach motivational structure were developed by establishing the associations between the scores for the SPSRQ and PCI indices. Correlations were also used to cross-validate the avoidance and approach motivational structure indices with the independent and dependent variables.

Hierarchical regression was used to predict alcohol use for each motivational pathway. The predictors for each model were entered in three steps; the first step in each model included the distal predisposition determinants, the second and third steps included the proximal motivational determinants of alcohol use. The third step included the motives for abstaining from alcohol determinants. No demographic variables needed to be controlled for in the regression models (e.g., sex). The control of extraneous independent variables in regression is important, because they can have an effect on how much variance the model accounts for, and on the relationship under investigation (see Pedhazur, 1997, p. 157). Regression assumptions and diagnostics

were applied to each model. No models violated the assumptions or diagnostics tests. G*Power 3 was used to calculate the post hoc power and effect size for each model (see Chapter 3 for a fuller discussion on these techniques). Power was set at .80 and α was set at .05 (two-tailed) for all the statistical tests employed in this study.

Mediation

This study used mediation analysis; an overview of this statistical technique and the procedures used to perform mediation analysis is presented next.

A simple bivariate correlation model establishes the direct relationship between the independent variable (X) and the dependent variable (Y). Whereas, a mediational model assumes that X is correlated with Y not because it exerts direct effects upon Y, but because it causes changes in M, and then M causes changes in Y (see Baron & Kenny, 1986). Mediation models extend simple bivariate correlation models by including a third variable, the mediator (M). A mediator accounts for the relationship between the predictor and the criterion (Baron & Kenny, 1986). The most important factor in a simple mediation model is the indirect effect of X on Y through M (Mackinnon, Fairchild, & Fritz, 2007). If a study includes a measure of the mediating variable (MV) alongside measures of the IV and DV, mediation is considered to be a viable method for eliciting further information from the study because it can be investigated statistically (MacKinnon et al., 2007). Figure 5.2 shows the X and Y relationships for a correlation and a mediation model.

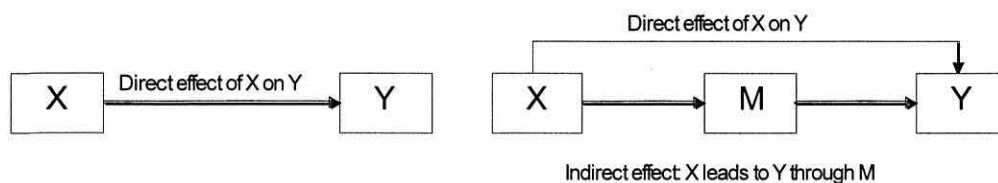


Figure 5.2. The X and Y relationships for a correlation (left) and mediation (right) model.

The causal steps or single-mediator approach (Mackinnon, Lockwood, Hoffman, West, & Sheets, 2002) for testing simple mediation is derived from the work of Baron and Kenny (1986). These authors stated four criteria that must be met when performing simple mediation. First, X must be correlated with Y. Second, X must be correlated with M. Third, M must be correlated with Y when controlling for the direct effect of X on Y. Fourth, when the effect of M on Y is removed, X should no longer correlate with Y. If this happens there is complete mediation, but if the correlation between X and Y is reduced, but still significant then there is partial mediation. According to Shrout and Bolger (2002), partial mediation occurs when: (1) X has a direct effect upon Y in addition to its indirect effect on Y through M, (2) X may have no direct effect on Y because it may have indirect effects on Y through M_1 and M_2 . If M_2 is not included in the model, then the indirect effect of X on Y that is accountable to M_2 will be mistakenly identified as the direct effect of X on Y through M, and (3) there may be two subsets of participants. Hence, in one subset there may be a direct effect for X on Y, and in the second subset there may only be an indirect effect for X on Y through M.

There are four steps to testing Baron and Kenny's simple mediation. In Step 1, the significance of the correlation between X and Y is established; the relationship

must be significant. In Step 2, the significance of the correlation between X and M is established. In Step 3, Y is predicted from X and M. The partial effect of M when controlling for X must be significant. In Step 4, the direct effect of X on Y is examined. Again, for complete mediation the β weight for X must not differ significantly from 0 (Zero). If the β weight is less than the correlation of X and Y but still significant then there is partial mediation (Shrout & Bolger, 2002).

Mackinnon et al. (2002) argue that X does not have to correlate with Y because X may have both a direct and an indirect effect on Y through M. They consider these effects to be equal in size but opposite in direction. Thus, mediation would occur even though X is not correlated with Y because X is functioning as a suppressor variable. In the regression equation it would be observed that the prediction for Y actually decreases as X increases (see Conger, 1974).

The indirect effect of X on Y through M can be computed by multiplying the coefficient for the XM path by the coefficient for the MY path. The coefficient for the XM path is the correlation between X and M. Likewise, the coefficient for the MY path is the β weight for M from the regression that predicted Y from X and M. The null hypothesis that the 'indirect effect' is zero in the population sampled can be equated by dividing the coefficient for the indirect effect by the standard error.² The most commonly used procedure to do this is Sobel's test. Sample sizes need to be large for the Sobel test, because the critical value for a two-tailed test must exceed +/-

² The indirect effect is defined as the mediational effect in which X leads to Y through M.

1.96 for $\alpha = .05$ (Preacher & Hayes, 2004). If the Sobel test is significant mediation has occurred.³

Baron and Kenny (1986) stated that there are two fundamental assumptions that should be met for mediation to have occurred: (1) there should be no measurement error in M, and (2) Y should not cause M (Preacher & Hayes, 2004). Measurement errors can be reduced by standardising or transforming variables to reduce the influence of outliers and centralise the distribution (see Chapter 3 for a fuller discussion on data transformations). In a similar manner, mediations that are based on theoretical predictions should reduce the possibility of violating Baron and Kenny's Y and M casual sequence assumption (stated above in assumption 2).

Mediation can be said to violate one of the assumptions of regression, that of collinearity (and multicollinearity), because for M to be a successful mediator it must correlate with X, and M must account for some of the unique variance in Y, but X must not account for all the unique variance in M. Collinearity in mediation can be reduced by combining the scores from instruments that contain separate scales to produce a global score, rather than using each scale score in the mediation analysis if the scale scores correlate with M and Y (see Chapter 3).

³ Sobel test formula: $z\text{-value} = a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2)$. Sobel test formula: Run a regression analysis with the independent variable predicting the mediator (M). This will give a and s_a (standard error of a). Next, run a regression analysis with the independent variable and mediator (M) both predicting the dependent variable. This will give b and s_b (standard error of b). Both a and b are the unstandardised regression coefficients from output tables. Square root (SQRT).

There are now a number of different approaches for undertaking mediation with single and multiple mediators (e.g., Bootstrapping). An alternative to these approaches is MedGraph: A PC programme to graphically depict mediation among three variables.⁴ MedGraph adheres to Baron and Kenny's principles and provides a graphical output that informs the user if there is no mediation, complete mediation or partial mediation. The graphical output also provides values for the Sobel's test alongside values for the indirect and direct effects. MedGraph was used to perform mediation in this study. The procedures for performing mediation in MedGraph are presented next.

Note on terminology. In mediation the direct effect is the magnitude of the correlation between the independent and dependent variable with the mediator included in the model. The indirect effect is the amount of the correlation between the independent and dependent variable that goes through the mediator to the dependent variable. Partial mediation occurs when the direct effect is small and full mediation occurs when the indirect effect is large.

Mediation with MedGraph

There are three simple steps that have to be performed to undertake mediation with MedGraph. In Step 1, the user identifies which of the variables is the independent variable (IV), mediating variable (MV), and dependent variable (DV) for the model. After doing this, the user then correlates the variables in a statistical programme (e.g., SPSS) and inputs the r values alongside the sample size into the

⁴ MedGraph was downloaded from: <http://www.victoria.ac.nz/psyc/staff/paul-jose/files/medgraph/medgraph.php>

programme interface. A key point to remember is that Pearson's r correlations are equivalent to β weights in regression models.

Step 2 requires the user to enter unstandardised and standardised β regression coefficients alongside the standard error values into the programme interface. The first cells require the user to enter the unstandardised β regression coefficient and standard error for the MV regressed on the IV. To do this MV is treated as the DV and the IV is treated as the IV in regression analysis. Next, the unstandardised β regression coefficient and standard error for the MV are entered into the next row of cells on the programme interface. To do this the DV has to be regressed on the IV and MV. Thus, the DV becomes the DV and the IV and MV are entered together as the IVs. After performing this regression analysis, the standardised β regression coefficient and standard error for the IV are entered into the last cell on the programme interface.

In Step 3, a graphical output of the mediation model is produced that contains information on: (1) the type of mediation achieved, (2) Sobel value and significance level, and (3) the values for the direct and indirect effects.

Sample Size Calculation

As previously indicated, a large sample is needed to calculate the Sobel test statistic in mediation. Sample size calculations were performed to meet this requirement and the requirements of regression. To obtain a medium effect size ($f^2 = 0.15$) with eight predictors, 107 participants needed to be tested at baseline (power = .80 and alpha = .05; Cohen, 1992). This figure was used as the minimum sample size for this study.

RESULTS

Preliminary Data Analyses

Descriptive statistics for the participants' scores, internal consistency, test-retest reliability correlations, differences associated with sample characteristics, and relationships between demographic and alcohol consumption scores, are presented first. Table 5.1 presents the means and standard deviations for the SPSRQ, R-COPE, RAUCB, DERS, DMQ, MAAQ variables, and TADD alcohol consumption scores. The abstainers from alcohol were not required to complete the Drinking Motives Questionnaire-Revised (DMQ), or TADD.

Two participants failed to complete the Difficulties in Emotion Regulation Scale fully (DERS), and two participants failed to complete the Motives for Abstaining from Alcohol Questionnaire fully (MAAQ). Nineteen participants did not complete the research version of the Personal Concerns Inventory (R-PCI). Eight of the nineteen participants reported that they did not have any personal concerns, whereas the other eleven participants failed to provide ratings on a number of the R-PCI rating scales. The data obtained from the abstainers from alcohol ($n = 29$) were excluded from the data analysis, because the main focus of this study was to test the relative and combined influence of the putative determinants within the motivational model of alcohol use. One other exclusion criterion was employed; the alcohol consumption scores index had six outliers removed from it after inspecting the frequency and normality graphs.

Table 5.1.

Means and standard deviations for independent variables.

| Measure | Variables | M | Sd |
|---------|-----------------------------|--------|--------|
| SPSRQ | Sensitivity to punishment | 11.47 | 5.30 |
| | Sensitivity to reward | 11.16 | 4.15 |
| R-COPE | Self-help coping | 22.15 | 5.56 |
| | Approach coping | 22.78 | 4.74 |
| | Avoidance coping | 12.65 | 3.19 |
| | Self-punishment coping | 20.04 | 5.03 |
| RAUCB | Realistic control beliefs | 5.06 | 0.63 |
| | Unrealistic control beliefs | 3.16 | 0.70 |
| DERS | Impulse | 11.82 | 5.12 |
| | Goals | 15.91 | 4.58 |
| | Nonacceptance | 14.02 | 6.01 |
| DMQ | Coping motives | 2.38 | 1.00 |
| | Enhancement motives | 3.04 | 0.93 |
| MAAQ | Negative consequences | 2.29 | 0.81 |
| | Dispositional risk | 1.42 | 1.52 |
| TADD | Alcohol consumption scores | 208.45 | 183.61 |

Internal Consistency and Test-Retest Reliability

Two measures of internal consistency and reliability were used in this study.

First, Cronbach's coefficient alphas were used to determine the internal consistency of each psychometric measure. The minimum accepted alpha value was set at .70 for this study (see Nunnally, 1978; Kline, 1993). No scales violated this assumption.

Second, test-retest reliability correlations were performed on the SPSRQ scores for those participants who participated in Studies 1 and 2 ($n = 60$, 29% of the sample). A minimum value of .80 was set for the Pearson correlations, as recommend

by Kline (1993). The SP scale scores were found to correlate at .90 and the SR scale scores were found to correlate at .80, indicating that the SPSRQ scales in this study were reliable and consistent.

Differences Associated with Sample Characteristics

Females were found to score higher on 1 R-Cope and 1 RAUCB index. First, they were found to score higher on self-help coping behaviour ($M = 22.83$, $sd = 5.23$) than their male ($M = 18.79$, $sd = 5.98$) counterparts, $t(170) = 3.69$, $p < .01$, $d = 0.57$ (medium effect). Second, they were found to score higher on unrealistic control beliefs ($M = 3.23$, $sd = .71$) than their male ($M = 2.86$, $sd = .56$) counterparts, $t(170) = 2.65$, $p < .01$, $d = 0.41$ (small effect).

Four differences were found for nationality on the IVs. Native English speakers scored higher than the non-native English speakers on: (1) SPSRQ sensitivity to punishment scale, (2) DERS goals scale, and (3) alcohol consumption scores. Non-native English speakers scored higher than the native English speakers on RAUCB unrealistic control beliefs. Table 5.2 presents the statistical values for the tests.

Table 5.2.

Nationality differences on independent variables.

| Variables | Native English speakers (n = 147) | | Non-native English speakers (n = 25) | | <i>t(df)</i> | <i>p</i> | <i>d</i> |
|-----------------------------|--------------------------------------|-----------|---|-----------|--------------|----------|----------|
| | <i>M</i> | <i>Sd</i> | <i>M</i> | <i>Sd</i> | | | |
| Sensitivity to punishment | 11.84 | 5.36 | 9.32 | 4.41 | 2.22 (170) | .028 | 0.34 |
| Goals | 16.23 | 4.60 | 14.08 | 4.19 | 2.19 (168) | .030 | 0.34 |
| Unrealistic control beliefs | 3.08 | 0.64 | 3.64 | 0.81 | 3.91 (170) | .000 | 0.60 |
| Alcohol consumption scores | 225.57 | 190.39 | 107.30 | 79.28 | 5.29 (81.30) | .000 | 1.16 |

Note: Cohen's *d* values: small, $d = 0.2$; medium, $d = 0.5$; and large, $d = 0.8$.

Relationships Between Demographic Variables and Alcohol Consumption Scores

Pearson correlations were performed to establish the relationships between the responses for the demographic questions and alcohol consumption scores. Total number of years of education ($r = -.16, p < .05$) and age of first drink ($r = -.17, p < .05$) were found to be negatively related to alcohol consumption. Number of years drinking on a regular basis was found to be positively related to alcohol consumption scores ($r = .20, p < .01$). No relationships were found between age, sex, and nationality with alcohol consumption scores. It would appear that in this sample these demographic distal predictors were independent of alcohol use.

Motivational Structure

Study 2 had four aims, as stated in the Introduction; the first of these was to develop formulas for avoidance and approach motivational structure. To do this, the relationships between SPSRQ scores and PCI indices were identified because they were the variables of interest. Prior to undertaking the correlations the 10 PCI indices were examined for normality; 5 indices were found to be non-normally distributed by being skewed and kurtosed.⁵ These indices were then normalised through Rankit area transformations. No PCI indices were found to violate the assumptions for normality after being transformed.

Prior to developing the personality-based motivational structure indices the data collected from the administration of the R-PCI was analysed with exploratory factor analysis. Generally, factor analysis of the averaged PCI indices tends to deliver a theoretically driven two factor solution. Factor 1 tends to be interpreted as representing adaptive motivational structure and Factor 2 maladaptive motivational structure (see Chapters 2, 4, and 5). However, all attempts to extract a reliable and valid three, two, or one factor solution with principal components analysis and maximum likelihood with and without orthogonal and oblique rotations failed to deliver a theoretical factor solution (see Cox & Klinger, 2004, p. 187). The factor solutions were considered to be spurious and unreliable because: (1) the overlap between three of the R-PCI indices was too large, (2) the maximum likelihood model assumptions were violated because of a Heywood case (the data did not fit a common

⁵ The transformed indices were: (1) average likelihood, (2) average know what to do, (3) average commitment, (4) average get, and (5) average avoid.

factor solution) and the models were not a good fit of the data, (3) all iterations failed to deliver a theoretically meaningful factor solution, and (4) no significant correlations were found to exist between the factors scores, dependent variables, and independent variable (alcohol consumption) for each iteration.

If the data had been forced into a theoretically meaningful two factor solution any associations that were found to exist between the factor scores, dependent variables, and independent variable would at best have been spurious and misleading, because they would not have been a true representation of the data. Hence, it was decided upon to employ two alternative approaches to determine indices for adaptive and maladaptive motivational structure. Likewise, indices were also determined for appetitive and aversive motivation with previously validated structural formulae (see Fadardi, 2004). First, none of the currently existing motivational structure structural formulas could be used, because the R-PCI lacked some of the necessary scales for determining these indices. In fact, different variations of the current motivational structure structural formulas were attempted (see Cook, 2004; Fadardi 2004), but the resultant index scores were found to be meaningless and unrelated to the dependent variables and independent variable. Second, the resultant index scores for appetitive and aversive motivation were also found to be meaningless and unrelated to the dependent variables and independent variable. What was most interesting, is that no correlations were found to exist between appetitive motivation index scores and sensitivity to reward scores or aversive motivation index scores and sensitivity to punishment scores. Theoretically, these variables should have been related because they are measuring similar constructs.

Due to the failure to identify a suitable factor solution or structural formula for adaptive and maladaptive motivational structure it was decided upon to use an

approach that was both theoretically and data driven. As stated in Chapter 4, the activities of the BAS and BIS have been empirically associated with goal-directed behaviour (see pages 125-130 for a review). Thus, personality-based theoretical formulas were developed on the interrelations between the scores for each personality factor and the averaged R-PCI indices. These formulas by being theoretical and data driven were considered by the present researcher to be a true representation of the data, and a better fit of the data than any of the currently available alternative approaches for deriving motivational structure indices.

Next, the relationships between the PCI indices were examined with correlations. The average 'If I try my best' index was found to have a large overlap with the average 'Control', 'Likelihood', and 'What to do' indices in the correlation matrix ($r = .59, .63, \text{ and } .61$, respectively). This resulted in the average 'If I try my best' index being excluded from the data analysis. After this, the relationships between the SPSRQ scores and PCI indices were established with correlations. Table 5.3 presents the correlations for SPSRQ scores and PCI indices.

Table 5.3.

Correlations for SPSRQ scores and PCI indices.

| Variables | SP | SR |
|--------------------|--------|------|
| Average get | Ns | Ns |
| Average avoid | Ns | Ns |
| Average likelihood | -.35** | .16* |
| Average control | -.18* | Ns |
| Average what to do | -.23** | Ns |
| Average happy | Ns | Ns |
| Average commitment | -.21** | Ns |
| Average long | .25** | Ns |
| Average sad | Ns | .19* |

Note: * $p < .05$, ** $p < .01$, and Ns = $p > .05$.

As can be seen in table 5.3, SP scores were found to be negatively related to 5 PCI indices. The following formula was used to derive an index for SP-motivational structure: (average How long will it take to make progress – average How likely am I to achieve it – average Do I know what to do to achieve it – average How committed do I feel to achieve – average How much control do I have in achieving it)/5. Hence, four indices were subtracted from “average How long will it take to make progress”. These indices represent factors that are related at a cognitive, affective, and motivational level, because they can be said to have a positive or a negative influence on goal perceptions, actions, and possibly outcomes. People expect to gain intrinsic and extrinsic affective rewards if they achieve goals or resolve concerns. The resultant SP-motivational structure index was deemed to represent an avoidance motivational structure rather than a maladaptive motivational structure, to avoid terminological confusion with the earlier work within the motivational model of alcohol use, where

this term was used differently (see Chapter 4 for a review of motivational structure and BIS goal-striving).

Next, to derive a formula for SR-motivational structure the pattern of correlations was examined for the SR scores and the PCI indices. The resultant motivational structure index was a combination of two indices (average How likely am I to achieve it and average How sad will I be if I cannot achieve it, respectively). Again, these two indices can be said to represent factors that are related at a cognitive, affective, and motivational level. If someone wants to, and thinks they can resolve a specific concern, they may be affectively disappointed if they then fail to adequately resolve the concern. In other words, people may make an emotional investment when they commit to resolving concerns or achieving goals. The following formula was used to derive an index for SR-motivational structure: $(\text{average How likely am I to achieve it} + \text{average How sad will I be if I cannot achieve it})/2$. The resultant SR-motivational structure index was deemed to represent an approach motivational structure, because it was not considered to be an index of adaptive motivational structure; it was deemed to represent concerns that may require little effort to resolve and which may yielded instant self-reward or gratification (see Chapter 4 for a review of motivational structure and BAS goal-striving).

The correlation values for the SR and two R-PCI scores are small, but this would be expected with a large N , and they are based on theoretical predictions. The associations identified between these variables need to be replicated in another study before the variables can be assumed to be consistently related.

Cross-validating Motivational Structure Indices

The relationships between the motivational structure indices and independent variables were examined for cross-validation purposes. Avoidance motivational structure scores were found to be positively related to: (1) SP, (2) maladaptive coping behaviours, (3) emotional dysregulation, and (4) coping alcohol use motives scores. They were also found to be negatively related to: (1) adaptive coping behaviour, (2) realistic control beliefs, and (3) average get concerns. Likewise, approach motivational structure scores were found to be positively related to: (1) SR, (2) adaptive coping behaviours, (3) realistic and unrealistic control beliefs, (4) average get concerns, and (5) alcohol consumption scores. They were also found to be negatively related to SP scores. Table 5.4 presents the correlations for the motivational structure indices, independent and dependent variables.

Table 5.4.

Correlations for motivational structure (MS) indices, independent and dependent variables.

| Variables | Avoidance MS | Approach MS |
|------------------------------|--------------|-------------|
| Sensitivity to punishment | .37** | -.27** |
| Sensitivity to reward | Ns | .22** |
| Self-help coping | Ns | .16* |
| Approach coping | -.28** | .18* |
| Avoidance coping | .23** | Ns |
| Self-punishment coping | .21** | Ns |
| Impulse control difficulties | .25** | Ns |
| Goals | .21** | Ns |
| Nonacceptance | .21** | Ns |
| Realistic control beliefs | -.39** | .19* |
| Unrealistic control beliefs | Ns | .17* |
| Coping motives | .19* | Ns |
| Enhancement motives | Ns | Ns |
| Negative consequences | Ns | Ns |
| Dispositional risk | Ns | Ns |
| Average get concerns | -.28** | .31** |
| Average avoid concerns | Ns | Ns |
| Alcohol consumption | Ns | .18* |

Note: * $p < .05$, ** $p < .01$, and Ns = $p > .05$.

Sensitivity to Punishment Motivational Pathway

The second major aim of Study 2 was to identify the relationships between the determinants of alcohol use in each motivational pathway. Therefore, SP scores were correlated with the independent and dependent variables to establish their

relationships. Table 5.5 presents the correlations for the SP scores, independent and dependent variables.

Table 5.5.

Correlations for SP scores, independent and dependent variables.

| Variables | SP |
|------------------------------|--------|
| Sensitivity to reward | Ns |
| Self-help coping | -.23** |
| Approach coping | -.28** |
| Avoidance coping | .41** |
| Self-punishment coping | .54** |
| Realistic control beliefs | -.57** |
| Unrealistic control beliefs | -.19* |
| Impulse control difficulties | .36** |
| Goals | .26** |
| Nonacceptance | .53** |
| Coping motives | .32** |
| Negative consequences | Ns |
| Alcohol consumption scores | -.16* |

Note: * $p < .05$, ** $p < .01$, and Ns = $p > .05$.

As can be seen in Table 5.5, SP scores were positively related to: (1) maladaptive coping behaviours, (2) difficulties in emotion regulation, and (3) coping alcohol use motives scores. They were negatively related to: (1) adaptive coping behaviours, (2) realistic control beliefs, and (3) alcohol consumption scores. No relationship was found between SP scores and negative consequences motives for abstaining from alcohol. It appears that in this sample the negative reinforcement aspects of alcohol use were seen as being preferable to the negative consequences motives for abstaining.

Unlike Study 1, this study found an inverse relationship between SP and alcohol use. Although it was predicted that SP scores and alcohol use would increase together, the opposite trend was found to exist in this sample. Participants with a low-SP ($M = 242.38$, $sd = 199.25$) were found to be consuming more alcohol than their high-SP ($M = 177.49$, $sd = 162.29$) counterparts, $t(170) = 2.35$, $p < .05$, $d = 0.36$ (small effect).

Mediators of SP and Alcohol Consumption

The third major aim of Study 2 was to identify the mediators of the relationships between personality and alcohol use in each motivational pathway and to predict alcohol consumption for each motivational pathway. SP scores were found to be associated with three DERS scales (nonacceptance, goals, and impulse). These scale scores were summed to produce a global score for emotional dysregulation.⁶ This was done to reduce the number of mediation models and to reduce collinearity (and multicollinearity) associated with separate scale scores in the mediation. In total, three predicted mediators of SP and alcohol consumption were identified: (1) emotional dysregulation, (2) avoidance motivational structure, and (3) coping alcohol use motives. No mediational relationship was found between SP, avoidance motivational structure, and alcohol consumption or between SP, negative consequences motives for abstaining, and alcohol consumption. Likewise, none of the distal determinants were found to mediate the relationship between SP and alcohol consumption (e.g., coping behaviour or control beliefs).

⁶ Gratz & Roemer (2004) state that the separate scale scores for the DERS can be summed to produce a global score for difficulties in emotion regulation (emotional dysregulation).

The next section presents the mediation models for emotional dysregulation and coping alcohol use motives. Mediation models were used because the indirect effects of a variable on the criterion variable are generally overlooked in most empirical research (e.g., Alwin & Hauser, 1975). If the indirect effect does not receive proper attention, the relationship between the two variables of interest cannot be fully considered (Raykov & Marcoulides, 2000, p. 7). The indirect effect is the amount of the original correlation between the independent and dependent variables that goes through the mediating variable.

Emotional Dysregulation as a Mediator Variable

Mediation was performed to test the prediction that emotional dysregulation mediated the relationship between SP and alcohol consumption. In Step 1, the SP independent variable (IV) was found to be correlated with the emotional dysregulation mediating variable (MV; $r = .49, p < .01; n = 170$) and alcohol consumption dependent variable (DV; $r = -.16, p < .05; n = 170$). Emotional dysregulation was found to be correlated with alcohol consumption ($r = .29, p < .01; n = 170$).

In Step 2, emotional dysregulation was regressed onto SP. SP predicted emotional dysregulation (unstandardised $\beta = 1.17$, Standard error = .16; standardised $\beta = .49, R^2 = .24, p < .01$). Next, alcohol consumption was regressed onto SP and emotional dysregulation (unstandardised $\beta = 7.19$, Standard error = 1.15; standardised $\beta = .49, p < .00$), and SP (standardised $\beta = -.41, p < .00$) predicted alcohol consumption ($R^2 = .21, p < .00$). Figure 5.3 presents the path diagram estimating the relationships between SP, emotional dysregulation, and alcohol consumption.

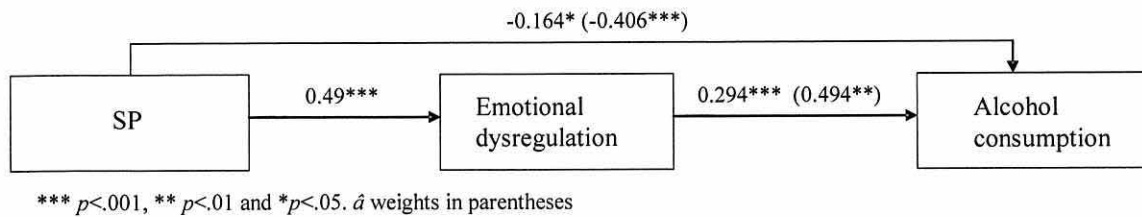


Figure 5.3. Path diagram estimating the relationships between SP, emotional dysregulation, and alcohol consumption.

The Sobel Z-value for the partial mediation model was 4.75, $p = .00$; it surpassed the ± 1.96 criteria for $\alpha = .05$. The direct effect of SP on alcohol consumption was $-.406$ and the indirect effect was $.242$. For partial mediation to occur the direct effect of the IV on the DV must be reduced but still remain significant when the MV is included into the model. Thus, in this study emotional dysregulation was only partially responsible for the effect that SP had on alcohol consumption. Thirty-seven percent of the effect of SP on alcohol consumption went through the emotional dysregulation mediating variable (indirect effect/total effect). SP was still found to have a significant direct effect on alcohol consumption.

Coping Alcohol Use Motives as a Mediator Variable

Mediation was performed to test the prediction that coping alcohol use motives mediated the relationship between SP (IV) and alcohol consumption (DV). In Step 1, SP (IV) was found to be correlated with coping alcohol use motives (MV; $r = .32$, $p < .01$; $n = 172$) and alcohol consumption ($r = -.16$, $p < .05$; $n = 172$). Coping alcohol use motives were found to be correlated with alcohol consumption ($r = .26$, $p < .01$; $n = 172$).

In Step 2, coping alcohol use motives were regressed onto SP. SP predicted coping motives (unstandardised $\beta = .06$, Standard error = .01; standardised $\beta = .32$, $R^2 = .10$, $p < .01$). Next, alcohol consumption was regressed onto SP and coping alcohol use motives. Coping alcohol use motives (unstandardised $\beta = 62.82$, Standard error = 13.78; standardised $\beta = .34$, $p < .00$) and SP (standardised $\beta = -.27$, $p < .01$) predicted alcohol consumption ($R^2 = .13$, $p < .00$). Figure 5.4 presents the path diagram showing the relationships between SP, coping alcohol use motives, and alcohol consumption.

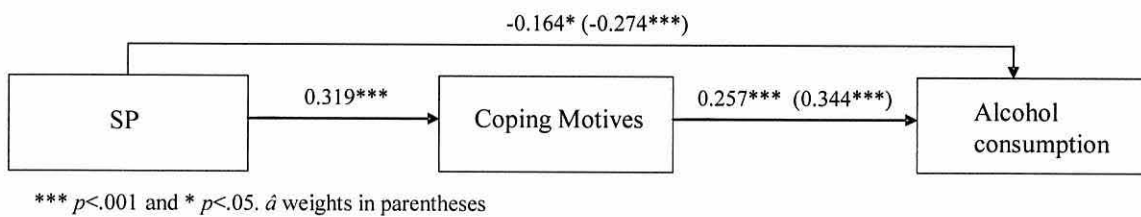


Figure 5.4. Path diagram showing the relationships between SP, coping alcohol use motives, and alcohol consumption.

The Sobel Z-value for the partial mediation model was 3.12, $p = .00$; it surpassed the ± 1.96 criteria for $\alpha = .05$. The direct effect of SP on alcohol consumption was $-.274$ and the indirect effect was $.11$. For partial mediation to occur the direct effect of the IV on the DV must be reduced but still remain significant when the MV is included into the model. Thus, in this study coping alcohol use motives were only partially responsible for the effect that SP had on alcohol consumption. Thirty-eight percent of the effect of SP on alcohol consumption went through the coping alcohol use motives mediating variable (indirect effect/total effect). SP was still found to have a significant direct effect on alcohol consumption.

Summary of SP Mediation Models

The relationship between sensitivity to punishment and alcohol consumption was partially mediated by two proximal motivational determinants. The average direct effect for SP was found to be -0.34. This was calculated by summing the direct effect for each model and dividing the total by the number of mediators: $(-0.406 + -0.274)/2$. The average indirect effect was .176. This was calculated by summing the indirect effect for each model and dividing the total by the number of mediators: $(0.242 + 0.11)/2$. On average, 37% of the effect of SP on alcohol consumption went through the mediating variables. Again, this was calculated by summing the percentage for each model and dividing the total by the number of mediators: $(38\% + 37\%)/2$. In each model about one-third of the effect of the independent variable on the dependent variable went through the mediating variable, and about two thirds of the effect was direct. The strength of the inverse relationship between SP and alcohol consumption was found to be higher in each successive model than in the previous model. The relationship between SP and alcohol consumption might be consistent with the reactivity of a weak BIS and not a strong BIS. A weak BIS has been empirically associated with approach dominant behaviours in conflict or distress situations (Fowles, 1980). Figure 5.5 shows the summary model for the SP and alcohol consumption mediations. In short, a weak SP was found to be directly and indirectly related to alcohol consumption. The combined influence of weak SP, emotional dysregulation, and coping alcohol use motives determinants might contribute to negative-emotionality driven excessive drinking.

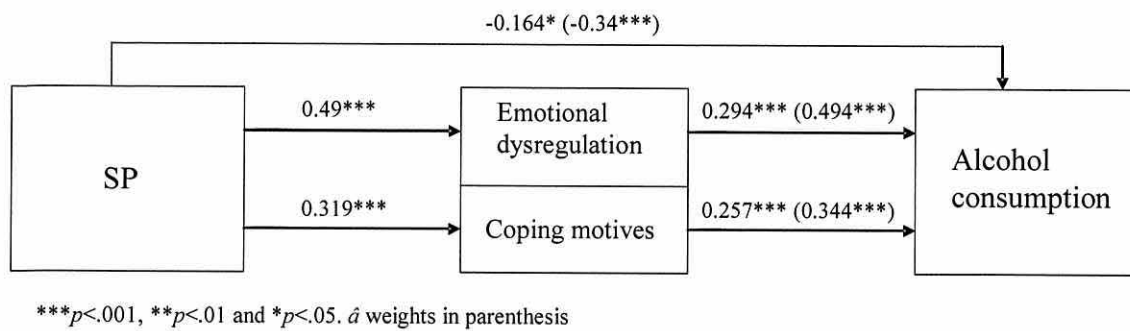


Figure 5.5. Path diagram summarising the SP and alcohol consumption mediations.

Predicting Alcohol Consumption for the SP Motivational Pathway

The three distal predictors were controlled for and entered into Step 1 (SP, avoidance, and self-punishment coping). The three proximal predictors were entered into Step 2 (avoidance motivational structure, emotional dysregulation, and coping alcohol use motives). One negative proximal predictor was entered into step 3 (negative consequences motives for abstaining from alcohol) and the criterion variable was alcohol consumption scores. The variables for the SP motivational pathway were entered in accord with the theoretical predictions of Chapters 4 and 5. Therefore, the variables that were considered to be the closest to the final decision to drink were entered after those that were considered to be the furthest away from the final decision to drink.

The distal predictors in Step 1 accounted for 14.1% of the variance in alcohol consumption scores, $F = 8.14 (3, 149)$, $p < .01$. SP was a negative predictor and coping behaviours (avoidance and self-punishment) were positive predictors. The proximal predictors entered into Step 2 yielded a significant R^2 change ($p < .01$). They accounted for an additional 12% of the unique variance, $F = 7.14 (3, 149)$, $p < .01$.

Avoidance motivational structure did not account for any of the additional variance in alcohol consumption. Emotional dysregulation and coping alcohol use motives were positive predictors and accounted for most of the additional variance. Step 3 yielded a significant R^2 change ($p < .01$). The negative proximal predictor accounted for an additional 5.2% of the unique variance. Negative consequences were the best negative predictor of alcohol consumption scores in the SP motivational pathway. The final model accounted for 31.2 % of the variance in alcohol consumption scores, $F = 9.38$ (7, 145), $p < .01$, $f^2 = 0.45$ (large effect). The power of the full model with seven predictors was 0.99 (see Table 5.6).

Table 5.6.

Hierarchical multiple regression analysis of the distal and proximal determinants to predict alcohol consumption scores for the SP motivational pathway.

| Variable | <i>B</i> | <i>SEB</i> | β | R^2 | ΔR^2 | $\Delta F(df)$ | Δp |
|---------------------------|----------|------------|---------|-------|--------------|----------------|------------|
| Step 1 | | | | .14 | .14 | 8.14 (3,149) | .000 |
| Sensitivity to punishment | -13.42 | 3.22 | -.39*** | | | | |
| Avoidance coping | 16.61 | 5.21 | .27** | | | | |
| Self-punishment coping | 7.24 | 3.34 | .20* | | | | |
| Step 2 | | | | .26 | .12 | 7.78 (3,146) | .000 |
| Sensitivity to punishment | -15.35 | 3.21 | -.45*** | | | | |
| Avoidance coping | 11.27 | 5.04 | .19* | | | | |
| Self-punishment coping | .61 | 3.57 | .02 | | | | |
| Avoidance MS | -17.77 | 18.51 | -.07 | | | | |
| Emotional dysregulation | 4.66 | 1.57 | .33** | | | | |
| Coping motives | 31.94 | 16.38 | .17* | | | | |
| Step 3 | | | | .31 | .05 | 11.05 (1,145) | .001 |
| Sensitivity to punishment | -13.88 | 3.13 | -.40*** | | | | |
| Avoidance coping | 13.09 | 4.91 | .21** | | | | |
| Self-punishment coping | -1.30 | 3.50 | -.04 | | | | |
| Avoidance MS | -17.60 | 17.90 | -.07 | | | | |
| Emotional dysregulation | 5.38 | 1.53 | .38*** | | | | |
| Coping motives | 15.71 | 16.58 | .09 | | | | |
| Negative consequences | -55.07 | 16.57 | -.24*** | | | | |

Note: * $p < .05$, ** $p < .01$, and *** $p < .00$.

Sensitivity to Reward Motivational Pathway

SR scores were correlated with the independent and dependent variables to establish their relationships Table 5.7 presents the correlations for SR scores, independent and dependent variables.

Table 5.7.

Correlations for SR scores, independent, and dependent variables.

| Variables | SR |
|------------------------------|-------|
| Sensitivity to punishment | Ns |
| Self-help coping | .24** |
| Approach coping | Ns |
| Avoidance coping | .23** |
| Self-punishment coping | .22** |
| Realistic control beliefs | Ns |
| Unrealistic control beliefs | Ns |
| Impulse control difficulties | .30** |
| Goals | .27** |
| Enhancement motives | .23** |
| Coping motives | .28** |
| Dispositional risk | Ns |
| Alcohol consumption scores | .37** |

Note: * $p < .05$, ** $p < .01$, and Ns = $p > .05$.

As can be seen in Table 5.7, SR scores were positively related to: (1) adaptive and maladaptive coping behaviours, (2) difficulties in emotion regulation, (3) coping and enhancement alcohol use motives, and (4) alcohol consumption. No relationship was found between SR and dispositional risk motives for abstaining from alcohol. It appears that in this sample the positive reinforcement aspects of alcohol use were seen

as being preferable to the dispositional risk motives for abstaining. Participants high on SR ($M = 236.36$, $sd = 197.53$) consumed more alcohol than those low on SR ($M = 156.29$, $sd = 140.16$), $t(156.92) = 3.08$, $p < .01$, $d = 0.49$ (small effect). This finding replicates the main findings of Study 1, which also found SR to be positively associated with students' alcohol consumption.

Mediators of SR and Alcohol Consumption

Sensitivity to reward (SR) scores were found to be associated with two DERS scales (impulse and goals). These scale scores were summed to produce a global score for emotional dysregulation. Doing so eliminated any problems associated with collinearity and multicollinearity. In total, four predicted mediators of SR and alcohol consumption were identified: (1) emotional dysregulation, (2) approach motivational structure, (3) coping alcohol use motives, and (4) enhancement alcohol use motives. In a similar fashion to the SP mediations, no mediational relationship was found between SR, approach motivational structure, and alcohol consumption or between SR, dispositional risk, and alcohol consumption. None of the distal determinants were found to mediate the relationship between SR and alcohol consumption (e.g., coping behaviour and control beliefs). The next section presents the findings for the emotional dysregulation, coping and enhancement alcohol use motives mediation models.

Emotional Dysregulation as a Mediator Variable

Mediation was performed to test the prediction that emotional dysregulation mediated the relationship between SR and alcohol consumption. In Step 1, SR (IV) was found to be correlated with emotional dysregulation (MV; $r = .33, p < .01; n = 170$) and alcohol consumption (DV; $r = .37, p < .01; n = 170$). Emotional dysregulation was found to be correlated with alcohol consumption ($r = .31, p < .01; n = 170$).

In Step 2, emotional dysregulation was regressed onto SR. SR predicted emotional dysregulation (unstandardised $\beta = .67$, Standard error = .15; standardised $\beta = .33, R^2 = .11, p < .01$). Next, alcohol consumption was regressed onto SR and emotional dysregulation (unstandardised $\beta = 4.69$, Standard error = 1.63; standardised $\beta = .21, p < .00$), and SR (standardised $\beta = .30, p < .01$) predicted alcohol consumption ($R^2 = .18, p < .00$). Figure 5.6 presents the path diagram showing the relationships between SR, emotional dysregulation, and alcohol consumption.

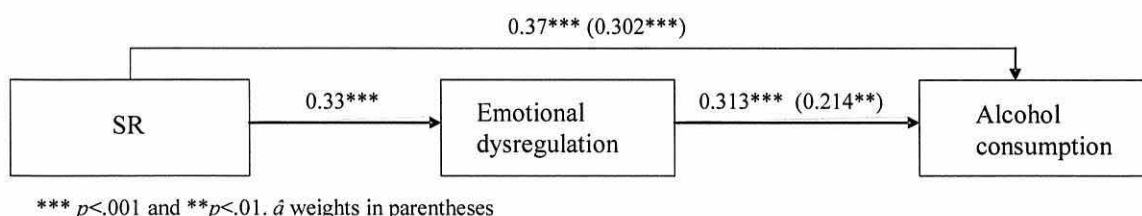


Figure 5.6. Path diagram showing the relationships between SR, emotional dysregulation, and alcohol consumption

The Sobel Z-value for the partial mediation model was 2.43, $p = .01$, it surpassed the ± 1.96 criteria for $\alpha = .05$. The direct effect of SR on alcohol consumption was .302 and the indirect effect was .068. For partial mediation to occur

the direct effect of the IV on the DV must be reduced but still remain significant when the MV is included into the model. Thus, in this study emotional dysregulation was only partially responsible for the effect that SR had on alcohol consumption. Eighteen percent of the effect of SR on alcohol consumption went through the emotional dysregulation mediating variable (indirect effect/total effect). SR was still found to have a significant direct effect on alcohol consumption scores.

Coping Alcohol Use Motives as a Mediator Variable

Mediation was performed to test the prediction that coping alcohol use motives mediated the relationship between SR and alcohol consumption. In Step 1, SR (IV) was found to be correlated with coping alcohol use motives (MV; $r = .28, p < .01; n = 172$) and alcohol consumption scores (DV; $r = .37, p < .01; n = 172$). Coping alcohol use motives were found to be correlated with alcohol consumption ($r = .26, p < .01; n = 172$).

In Step 2, coping alcohol use motives were regressed onto SR. SR predicted coping alcohol use motives (unstandardised $\beta = .07$, Standard error = .02; standardised $\beta = .28, R^2 = .08, p < .01$). Next, alcohol consumption was regressed onto SR and coping alcohol use motives. Coping alcohol use motives (unstandardised $\beta = 30.76$, Standard error = 13.38; standardised $\beta = .17, p < .05$) and SR (standardised $\beta = .32, p < .00$) predicted alcohol consumption ($R^2 = .16, p < .00$). Figure 5.7 presents the path diagram showing the relationships between SR, coping alcohol use motives, and alcohol consumption.

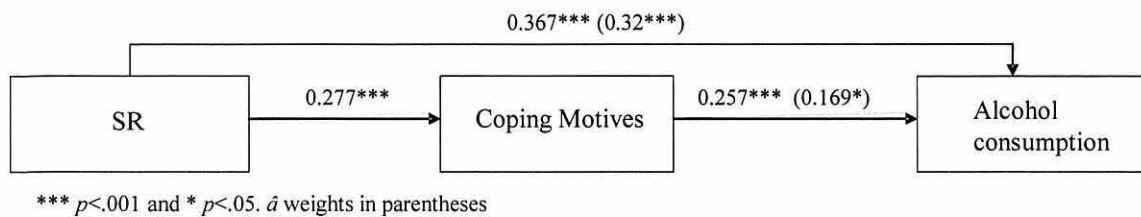


Figure 5.7. Path diagram estimating the relationships between SR, coping alcohol use motives, and alcohol consumption.

The Sobel Z-value for the partial mediation model was 1.96, $p = .05$, it equalled the ± 1.96 criteria for $\alpha = .05$. The direct effect of SR on alcohol consumption was .32 and the indirect effect was .047. For partial mediation to occur the direct effect of the IV on the DV must be reduced but still remain significant when the MV is included into the model. Thus, in this study coping alcohol use motives were only partially responsible for the effect that SR had on alcohol consumption. Thirteen percent of the effect of SR on alcohol consumption went through the coping alcohol use motives mediating variable (indirect effect/total effect). SR was still found to have a significant direct effect on alcohol consumption.

Enhancement Alcohol Use Motives as a Mediator Variable

Mediation was performed to test the prediction that enhancement alcohol use motives mediated the relationship between SR and alcohol consumption. In Step 1, SR (IV) was found to be correlated with enhancement alcohol use motives (MV; $r = .23, p < .01; n = 172$) and alcohol consumption (DV; $r = .37, p < .01; n = 172$). Enhancement motives were found to be correlated with alcohol consumption ($r = .41, p < .01; n = 172$).

In Step 2, enhancement alcohol use motives were regressed onto SR. SR predicted enhancement alcohol use motives (unstandardised $\beta = .05$, Standard error = .02; standardised $\beta = .23$, $R^2 = .06$, $p < .01$). Next, alcohol consumption was regressed onto SR and enhancement alcohol use motives. Enhancement alcohol use motives (unstandardised $\beta = 67.71$, Standard error = 13.50; standardised $\beta = .34$, $p < .00$) and SR (standardised $\beta = .29$, $p < .00$) predicted alcohol consumption ($R^2 = .25$, $p < .00$). Figure 5.8 presents the path diagram showing the relationships between SR, enhancement alcohol use motives, and alcohol consumption.

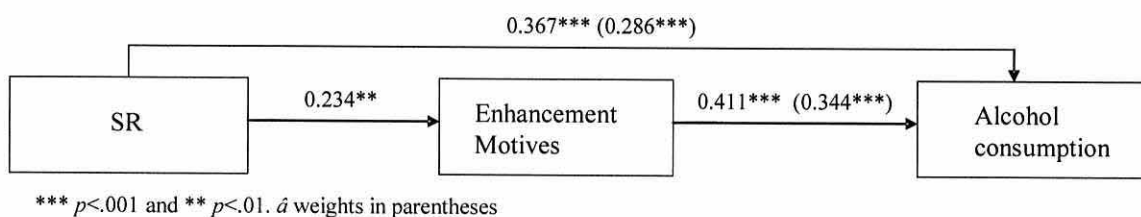


Figure 5.8. Path diagram showing the relationships between SR, enhancement alcohol use motives, and alcohol consumption.

The Sobel Z-value for the partial mediation model was 2.65, $p = .00$, it surpassed the ± 1.96 criteria for $\alpha = .05$. The direct effect of SR on alcohol consumption was .286 and the indirect effect was .081. For partial mediation to occur the direct effect of the IV on the DV must be reduced but still remain significant when the MV is included into the model. Thus, in this study enhancement alcohol use motives were only partially responsible for the effect that SR had on alcohol consumption. Twenty-two percent of the effect of SR on alcohol consumption went through the enhancement alcohol use motives mediating variable (indirect effect/total effect). SR was still found to have a significant direct effect on alcohol consumption.

Summary of SR Mediation Models

The relationship between sensitivity to reward and alcohol consumption was partially mediated by three proximal determinants (emotional dysregulation, coping and enhancement alcohol use motives). The average direct effect for SR was found to be .30. This was calculated by summing the direct effect for each model and dividing the total by the number of mediators: $(0.302 + 0.320 + 0.286)/3$. The average indirect effect was .07. This was calculated by summing the indirect effect for each model and dividing the total by the number of mediators: $(.068 + .047 + .081)/3$. On average, 17% of the effect of SR on alcohol consumption went through the mediating variables. Again, this was calculated by summing the percentage for each model and dividing the total by the number of mediators: $(18\% + 13\% + 21\%)/3$. In each model, less than one third of the effect of the independent variable on the dependent variable went through the mediating variable, and about two thirds of the effect was direct.

The strength of the positive relationship between SR and alcohol consumption was found to be lower in each successive model than in the previous model. The relationships between SR and alcohol consumption might be consistent with the reactivity of a strong BAS. A strong BAS has been empirically associated with approach dominant behaviours in rewarding situations like alcohol consumption. It may be that, in this sample, participants with a strong BAS drank alcohol for its affect enhancing properties (enhancement alcohol use motives) and as a means to alleviate negative emotionality (e.g., emotional dysregulation and coping alcohol use motives, to feel good or better). Figure 5.9 shows the summary model for the SR and alcohol consumption mediations. This figure should not be confused with those derived from path analysis or structural equation modelling, it is for illustration purposes only.

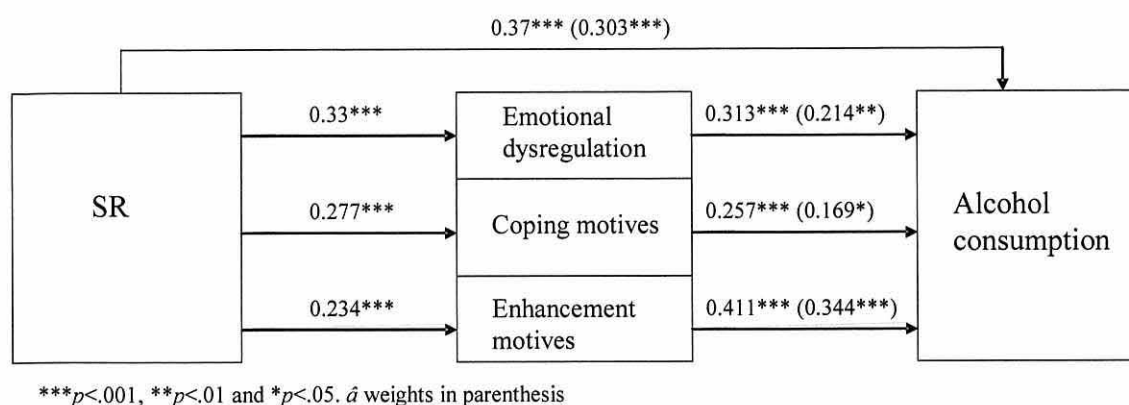


Figure 5.9. Path diagram summarising the SR and alcohol consumption mediations.

Predicting Alcohol Consumption for the SR Motivational Pathway

One distal predictor, sensitivity to reward, was entered into Step 1. Three proximal predictors were entered into Step 2 (approach motivational structure, emotional dysregulation, and enhancement alcohol use motives). One negative proximal predictor was entered into step 3 (negative consequences motives for abstaining from alcohol) and the criterion variable was alcohol consumption scores. No control variables were needed for the regression model; initial inspection established that they accounted for none of the unique variance in alcohol consumption. Like the regression model for the SP motivational pathway, the variables for the SR motivational pathway were entered in accord with the theoretical predictions of Chapters 4 and 5. Again, the variables that were considered to be the closest to the final decision to drink were entered after those that were considered to be the furthest away from the final decision to drink.

The distal predictor in Step 1 accounted for 16.3% of the variance in alcohol consumption, $F = 29.36 (1,151)$, $p < .01$. SR was a positive predictor of alcohol consumption. The proximal predictors entered into Step 2 yielded a significant R^2 change ($p < .01$). They accounted for a further 13.7% of the unique variance, $F =$

15.83 (4,148), $p < .01$. Approach motivational structure did not account for any of the additional variance in alcohol consumption. Emotional dysregulation and enhancement alcohol use motives were the best positive predictors and accounted for most of the additional variance. Step 3 yielded a significant R^2 change ($p < .05$). The proximal predictor accounted for an additional 2.9% of the unique variance. Negative consequences were the best negative predictor of alcohol consumption in the SR motivational pathway. The final model accounted for 32.9 % of the variance in alcohol consumption, $F = 14.39$ (5, 147), $p < .01$, $f^2 = 0.49$ (large effect). The power of the full model with five predictors was 0.99 (see Table 5.8).

Table 5.8.

Hierarchical multiple regression analysis of the distal and proximal determinants to predict alcohol consumption for the SR motivational pathway.

| Variable | <i>B</i> | <i>SEB</i> | β | R^2 | ΔR^2 | $\Delta F(df)$ | Δp |
|-------------------------|----------|------------|---------|-------|--------------|----------------|------------|
| Step 1 | | | | .16 | .16 | 29.36 (1,151) | .000 |
| Sensitivity to reward | 17.92 | 3.31 | .43*** | | | | |
| Step 2 | | | | .30 | .14 | 9.64 (3,148) | .000 |
| Sensitivity to reward | 11.61 | 3.37 | .26*** | | | | |
| Approach MS | 17.82 | 11.93 | .11 | | | | |
| Emotional dysregulation | 3.12 | 1.60 | .14* | | | | |
| Enhancement motives | 61.43 | 13.84 | .32*** | | | | |
| Step 3 | | | | .33 | .03 | 6.33 (1,147) | .013 |
| Sensitivity to reward | 10.98 | 3.32 | .25*** | | | | |
| Approach MS | 18.35 | 11.72 | .11 | | | | |
| Emotional dysregulation | 3.37 | 1.58 | .16* | | | | |
| Enhancement motives | 52.05 | 14.10 | .27*** | | | | |
| Negative consequences | -40.03 | 15.90 | -.18* | | | | |

Note: * $p < .05$, ** $p < .01$, and *** $p < .00$.

Drinking Motives and Motives for Abstaining from Alcohol

The fourth and final aim of Study 2, stated in the Introduction section, was to establish the relationships between a measure of drinking motives and motives for abstaining from alcohol. Negative consequences motives for abstaining from alcohol were found to be inversely related to coping ($r = -.19, p < .05$) and enhancement alcohol use motives ($r = -.24, p < .01$). No relationships were found between dispositional risk motives for abstaining and coping or enhancement alcohol use motives.

DISCUSSION

Study 2 was designed to establish the two alternative motivational pathways of alcohol use that were derived from RST and based on Cox and Klinger's model. To do this, the study administered self-report measures of the distal (predisposition) determinants of alcohol use, the proximal (motivational) determinants of alcohol use, and alcohol consumption. This was the first study to test such a complex pattern of theoretically derived determinants within the framework of the motivational model of alcohol use. To do this, formulas for avoidance and approach motivational structure were established first, the relationships between the determinants in each motivational pathway were explored next, the mediators of alcohol use were identified in each pathway, and regressions were used to predict alcohol use for each pathway. The results of each procedure are discussed next.

Motivational Structure

The first aim of the study was to develop formulas for avoidance and approach motivational structure. The relationships between SP and PCI indices were examined, and the resultant index was considered to represent an avoidance motivational structure. SP scores were found to be negatively associated with 5 PCI indices. This pattern of results showed that individuals with an avoidance motivational structure may take a long time to resolve their concerns, may not resolve their concerns, may not know what to do to resolve their concerns, may not be committed to resolving their concerns, and may have very little control over resolving their concerns. This profile is similar to that for a maladaptive motivational structure. As reviewed in Chapter 4, people with a maladaptive motivational structure are less engaged in their goal-pursuits than those with an adaptive motivational structure. They may also expect to obtain little emotional reward from pursuing or achieving goals.

In contrast, the resultant motivational structure index for the relationships between SR and PCI indices was considered to represent an approach motivational structure rather than an adaptive motivational structure, because a person with an approach motivational structure might be motivated by approach goals or concerns that require little attention or effort to resolve, which yield instant self-gratification or reward. Individuals with an approach motivational structure may resolve their concerns and may feel sadder if they fail to resolve their concerns. Both types of motivational structure were considered to be maladaptive in nature because they may have a detrimental effect on goal-striving behaviour and general well-being. In fact, both types of motivational structure may be associated with people who are enthused by alcohol and not those who are not enthused by alcohol. Furthermore, drinkers with an approach motivational structure may benefit from motivational goal-setting

training if it encourages them to divert some of their goal-striving activities away from immediate pleasure-seeking goals to more rewarding medium and long term sub-goal pursuits.

As was expected, there were a number of noteworthy relationships between avoidance motivational structure and the independent variables. Avoidance motivational structure was positively associated with SP scores, maladaptive coping behaviour scores (avoidance and self-punishment), emotional dysregulation scores (impulse control difficulties, goals, and nonacceptance), and coping alcohol use motives scores. Avoidance motivational structure scores were negatively associated with adaptive coping behaviour scores (approach), realistic control beliefs scores, and average get concerns. This pattern of relationships may be in keeping with a personality type that is marked by avoidance goal-striving motivation and behaviours. This was the first study to identify this pattern of associations between an avoidance motivational structure, and coping, emotional dysregulation, and motivational determinants of alcohol use. No relationship was found between avoidance motivational structure and alcohol consumption scores. This pattern of findings is important because it indicates that an avoidance motivational structure may be associated with self-regulatory processes (e.g., emotional regulation). Any deficits in self-regulatory processes may cause goal-striving behaviours to be avoided, disengaged from early, or abandoned completely. An individual with this type of motivational profile may not achieve personal goals that facilitate increases in self-esteem and general well-being, factors that can motivate people to strive for more goals. They may also drink for negative reinforcement reasons, as a means to reduce negative emotional states. This type of drinker may benefit from a motivational education programme that incorporates coping skills training, emotional regulation

strategies, and structured goal-setting tasks; all of these factors should help facilitate the attainment of personal goals, and result in increases in self-esteem and general well-being.

As expected, there were also a number of noteworthy relationships between approach motivational structure, independent and dependent variables. Approach motivational structure scores were weakly associated with adaptive coping behaviour scores (self-help and approach), realistic and unrealistic control belief scores, and alcohol consumption scores. Approach motivational structure scores were also moderately associated with SR scores and number of get concerns, and negatively associated with SP scores. This pattern of relationships may be in keeping with a personality type that may be associated with dysregulated approach goal-striving motivation and actions, a motivational structure that may view alcohol as another form of positive incentive. The findings also show that drinkers with an approach motivational structure may have illusionary perceptions of control that may result in disappointment and negative consequences, because they believe that they can influence the outcome of uncontrollable events. It is possible that some such drinkers may learn, as they mature, that not all life events are controllable and that sometimes it is better to relinquish control over events that one cannot control, although other such drinkers may not learn this adaptive process and continue to have a systematic bias in their control beliefs. A motivational education programme might help a drinker with this type of motivational structure profile to develop short, medium, and long-term non-alcohol related goals, which may facilitate increases in non-alcohol related self-reinforcement activities (e.g., developing a hobby or taking up a sporting activity).

Like avoidance motivational structure, this was the first study to identify this pattern of associations between an approach motivational structure, coping, and control belief determinants of alcohol use. The results for the cross-validation showed that the avoidance and approach motivational structure index scores were viable, valid, and reliable scores that could be included in mediation and regression analysis.

Indices for avoidance and approach motivational structure failed to mediate the relationship between personality and alcohol consumption; they also failed to account for any of the unique variance in alcohol consumption. These failings are possibly due to imperfections in the R-PCI, which had been used in one previous study (see Fadardi, 2004) but had not yet been cross-validated in different samples. In the present study, the average 'If I try my best' index had to be removed from the data analysis because it was found to share a large amount of overlap with three other PCI indices ('Control', 'Likelihood', and 'What to do'). The Average 'Happy' PCI index only shared a weak association with SR scores. Therefore, the failings are not considered to be due to the avoidance and approach motivational structure indices *per se*. The findings for motivational structure might have been better if the full PCI or the Motivational Structure Questionnaire (MSQ) had been administered. These instruments were not administered because of the lengthy time constraints associated with administering them (they are administered in an interview format). There are approximately four or five alternative versions of the PCI that can be administered to participants; the best version is still waiting to be identified. Hence, a suitable self-report version of the PCI needs to be developed and standardised across multiple samples.

Two Motivational Pathways of Alcohol Use

Specific predictions were formed at the outset of Study 2 regarding two motivational pathways and the relationships between the distal and proximal determinants in each pathway and students' alcohol consumption. The results concerning these two pathways are discussed next.

SP Motivational Profile

The hypothesis that there would be a SP motivational profile was supported by the present data. This was the first study to find a complex pattern of associations between a SP predisposition, emotional dysregulation, and motivational constructs of RST among a sample of student drinkers. First, SP scores were positively associated with maladaptive coping behaviour (avoidance and self-punishment), emotion dysregulation (impulse control difficulties, goals, and nonacceptance), and coping alcohol use motives scores. No published studies have identified this pattern of associations between these determinants of alcohol use among a sample of student drinkers. Second, SP scores were also negatively associated with adaptive coping behaviour scores (self-help and approach), realistic and unrealistic control beliefs, and alcohol consumption scores.

The present study was the first to find an inverse relationship between SP scores and R-COPE adaptive coping behaviour factors. These findings are consistent with the published findings from other studies that have employed comparable singular constructs (e.g., Cook, 2004; Ferguson, 2001; Gray, 1994; Hasking, 2006, 2007; Heponiemi et al., 2003; Stewart et al., 2002; Stewart & Zeitlin, 1995; Windsor et al., 2008). No published studies have identified this pattern of associations between

SP scores, adaptive R-COPE factors, and control beliefs among a sample of student drinkers. However, the present study was also the first to find an inverse relationship between SP and realistic control beliefs. This result can be interpreted by reference to the claims of Zuckerman et al. (2004), who stated that high realistic control beliefs are associated with the attainment of goals and adaptive coping behaviour. The present results show that the inverse may also be true: high-SP and low-realistic control beliefs could be associated with the non-attainment of goals and maladaptive coping behaviour (e.g., self-punishment). Low realistic control beliefs are viewed by the present researcher as an indicator of unhealthy goal-striving processes and actions that might have a detrimental effect on self-development and psychological well-being.

The SP Motivational Pathway

It was predicted that the relationship between SP and alcohol consumption would be mediated by four proximal motivational determinants: (1) emotional dysregulation, (2) avoidance motivational structure, (3) coping alcohol use motives, and (4) negative consequences motives for abstaining from alcohol. This hypothesis was partially supported. The relationship was found to be partially mediated by two proximal determinants derived from Cox and Klinger's model (emotional dysregulation and coping alcohol use motives). On average, just over a third of the effect of SP on alcohol consumption was indirect. This was the first study to identify that emotional dysregulation and coping alcohol use motives mediated the relationship between a weak BIS and alcohol use in a sample of student drinkers.

In regression, three distal determinants (SP, avoidance and self-punishment coping) were significant predictors of alcohol use; the same was true of two proximal determinants (emotional dysregulation and coping alcohol use motives) and of one

inversely related motive for abstaining from alcohol (negative consequences motives). The full model accounted for 31.2% of the unique variance in alcohol consumption scores and was found to be reliable and have a large effect size.

The mediation and regression models showed that a weak BIS (SP-) was associated with alcohol consumption. This finding is consistent with the trends reported in the published literature. Wagner (2001) found that anxiety-sensitivity was an inverse predictor of substance abuse in a student sample. Likewise, in an article published after this study had been designed and completed, Hundt et al. (2008) found that low BIS scores predicted drug use and hyperactive-impulsive symptoms. The inverse relationship between BIS scores and alcohol use is also in line with those reported by Knyazev et al. (2004), who found high BIS scores to be a protection factor from substance misuse in females, and Cox and Blount (1998), who also found punishment-sensitivity to be a protection factor from substance misuse. Hogan (2005) also showed that harm-avoidance was an inverse predictor of alcohol consumption in a student sample; in this study, Cloninger's harm-avoidance temperament construct was used, which is comparable to Gray's sensitivity to punishment personality predisposition.

Fearlessness may be a central characteristic of a weak BIS; fearless people tend to have response preservation tendencies, which may cause them to continue to seek rewards despite receiving punishment and act impulsively (Matthys, van Goozen, Snoek, & Engeland, 2004). Vaughn and colleagues found that adolescent inhalant users had profiles that were marked by past drug use, a variety of inhalant substances used, impulsivity, and fearlessness (Vaughn, Perron, & Howard, 2007). It would appear that in general, and in the present sample, being fearless may contribute to excessive drinking. Younger people may also be fearless and drink impulsively

because they have very few social responsibilities, do not receive any form of social condemnation for excessive drinking from their cohort, and do not perceive themselves as being vulnerable to the personal harms associated with alcohol abuse (e.g., liver disease). However, as stated in Chapter 2, the SP scale of the SPSRQ assesses the combined functions of the BIS and FFFS. Hence, fearlessness in this sample might be the result of a weak BIS, a weak FFFS, or a combination of both.

When the proximal determinants were regressed onto alcohol consumption scores after controlling for the distal determinants, emotional dysregulation and coping alcohol use motives uniquely predicted alcohol consumption scores in the SP motivational pathway. This finding agrees with the tenets of Cox and Klinger's model, which claims that people drink for affective change. Cox and Klinger's prediction about the final decision to not drink was also supported, because negative consequences motives for abstaining from alcohol (cognitive mediators) were found to be the best inverse predictor of alcohol consumption scores in the SP motivational pathway. According to Cox and Klinger's model, if the negative consequences of drinking outweigh the positive consequences, then the final decision will be to not drink (see Chapters 2 and 4). This result is also consistent with the predictions and findings of Stritzke & Butt (2001). Motivational training that incorporates negative consequences motives for abstaining may be beneficial to prevention, harm-reduction, treatment, and relapse-prevention programmes that challenge positive expectancies, reasons, or motives for drinking, especially if they cause a decrease in positive alcohol cognitions and an increase in negative alcohol cognitions (see Jones, 2004).

This was the first study to successfully predict alcohol consumption for a weak BIS predisposition with coping, emotional dysregulation, and motivational determinants of alcohol use among a sample of student drinkers. This pathway

accounted for more of the unique variance in alcohol use than those generally reported in the published literature, which tended to employ smaller numbers of predictors. For example, Novak et al. (2003) found that anxiety-sensitivity failed to predict alcohol consumption. Whereas, Kushner, Thuras, Abrams, Brekke, and Stritar (2001) found that trait anxiety mediated the relationship between anxiety-sensitivity and coping alcohol use motives. State anxiety failed to mediate the same relationship. In another study, Comeau, Stewart, and Loba (2001) found that the demographic and personality variables accounted for 10% of the unique variance in coping alcohol use motives, and 6% of the unique variance in enhancement alcohol use motives. These studies either failed to predict substance use with a measure of anxiety-sensitivity, or found anxiety-sensitivity scores to be inversely related to substance use, or accounted for only a small amount of the unique variance in alcohol-specific motivations or substance use (e.g., cigarette and alcohol use). In fact, the findings for anxiety-sensitivity show the same pattern of inconsistencies as those reported for the behavioural inhibition system (see Chapters 2 and 3). In the introduction section of Chapter 2, it was stated that alcohol use is a multiply determined behaviour that is best assessed with a multidimensional framework. The findings for the SP motivational pathway support this premise and the predictive utility of complex models, such as Cox and Klinger's model, to identify and establish the determinants of alcohol use.

SR Motivational Profile

The hypothesis that there would be a SR motivational profile was partially supported. This was also the first study to find a complex pattern of associations between a SR predisposition, emotional dysregulation, and motivational constructs of

RST among a sample of student drinkers. First, SR was found to be positively associated with adaptive (self-help) and maladaptive (self-punishment and avoidance) coping behaviour, emotional dysregulation (impulse control difficulties and goals), coping and enhancement alcohol use motives, and alcohol consumption. As was stated in Chapter 4, BAS sensitivities (SR+) tend to be associated with adaptive and maladaptive coping. The type of coping used by SR+ participants is generally considered to be problem specific (see Hasking, 2006). Especially, if the coping response results in an increase in positive affect and a down-regulation of negative affect. Further, active-avoidance is another key factor of BAS motivated actions. Thus, a SR+ drinker might employ avoidance coping if it enables him or her to avoid punishing or aversive problems or stressors. The relationships between SR, emotional regulation, and alcohol use motives are theoretically important because they show that SR+ drinkers may consume alcohol to bring about an affect change. An affective change that might be driven by hedonistic and avoidance motivations. A point that is consistent with the tenets of Cox and Klinger's model. These findings are theoretically and statistically consistent with the previously reported findings from studies that have employed comparable singular constructs (e.g., Copper, 1994; Ferguson, 2001; Fox et al., 2007; Gray, 1992; Hasking, 2007; O'Connor & Colder, 2004, Stewart et al., 2001). Contrary to predictions, no relationships were found between SR and realistic and unrealistic control beliefs.

Structure of the SR Motivational Pathway

It was predicted that the relationship between SR and alcohol use would be mediated by four proximal motivational determinants: (1) emotional dysregulation, (2) approach motivational structure, (3) enhancement alcohol use motives, and (4)

dispositional risk motives for abstaining from alcohol. This hypothesis was partially supported. The relationship between SR and alcohol consumption was found to be partially mediated by three proximal determinates derived from Cox and Klinger's model (emotional dysregulation, coping and enhancement alcohol use motives). This was the first study to identify that emotional dysregulation, coping and enhancement alcohol use motives mediated the relationship between SR and alcohol use in a sample of student drinkers. On average, less than one-third of the effect of SR on alcohol consumption was indirect.

The finding for emotional dysregulation is consistent with the trends reported after this study had been designed and completed: Fox et al. (2007) concluded that impulse control difficulties were a risk factor for the potential relapse to cocaine use. Drinkers with a strong BAS may benefit from motivational training programmes that include negative emotion regulation strategies, because the BAS may also be associated with adverse reactions to negative emotions (see Chapter 4). Emotional dysregulation is viewed by the present researcher as being a deficit in self-regulatory processes, because emotional regulation might be a goal-oriented process that requires self-control. People may experience negative emotions in their daily lives and they need to be able to behaviourally regulate them so they can achieve immediate, medium, and long-term goals. Hence, a drinker with a strong BAS who is unable to regulate negative emotions might drink to feel good or feel better about himself or herself, because of his or her inability to maintain goal-orientated processes when experiencing negative emotions.

The findings for the coping and enhancement alcohol use motives are also consistent with those reported after this study had been designed and completed: Magid, MacLean, and Colder (2007) found that the relationship between impulsivity

and alcohol use was mediated by coping alcohol use motives and the relationship between sensation-seeking and alcohol use was mediated by enhancement alcohol use motives. Impulsivity and sensation-seeking both share a large amount of common variance with sensitivity to reward or reward drive. Magid and colleagues concluded that impulsivity and sensation-seeking (SR or reward drive) both form separate pathways with drinking motives to alcohol misuse and alcohol-related problems.

In regression analysis, the sole predisposition distal determinant (SR) was a significant predictor of alcohol use; the same was true of three proximal motivational determinants entered next (emotional dysregulation, coping and enhancement alcohol use motives), and of one inversely related motive for abstaining from drinking (negative consequences motive). The full model accounted for 32.9% of the unique variance in alcohol consumption and was found to be reliable and have a large effect size.

The mediation and regression models indicated that SR scores are directly related to alcohol consumption. Thus, drinkers with a strong BAS may be more at risk of developing disinhibited alcohol misuse because they perceive alcohol to be rewarding for positive and negative reinforcement reasons. Taylor, Reeves, James, and Bobadilla (2006) found two trait profiles that may put people at risk of developing substance abuse problems. One trait profile was associated with low constraint, high impulsivity, weak BIS (or SP-), and strong BAS (or SR+); the other profile was associated with high negative emotionality and strong BIS (SP+). Both trait profiles may show elevated drug use problems and have some form of Cluster B personality disorder (e.g., antisocial personality disorder). Alternatively, such individuals may simply be unable to regulate their nonsubstance and substance use related behaviours (they may have an inhibition deficit). When the proximal

determinants were regressed on alcohol consumption after controlling for SR, emotional dysregulation and enhancement alcohol use motives uniquely predicted alcohol consumption scores in the SR motivational pathway. This finding supports the tenets of Cox and Klinger's model, which states that people decide to drink for affective change.

In this sample, Cox and Klinger's view about the final decision to not drink was supported in the SR motivational pathway by an unexpected finding. Theoretically it was predicted that dispositional risk motives would be an inverse predictor of alcohol use in the SR motivational pathway. This was not found; instead, negative consequences motives were found to be the best inverse predictor of alcohol consumption in both pathways. Although not predicted, this outcome could be explained as follows: If excessive drinkers continue to experience negative consequences from their alcohol use, this may motivate them to reduce or stop drinking, regardless of personality predisposition. In line with this, Hayaki et al. (2005) reported finding a strong association between impulsivity and adverse life events (negative consequences of substance abuse) among a sample of drug users in treatment. The present study findings regarding negative consequences motives for abstaining from alcohol and alcohol consumption scores were consistent with those reported in the literature (e.g., Demone, 1973; Reeves & Draper, 1984; Johnson & Cohen, 2004). In addition, as expected, none of the predisposition determinants were found to mediate the relationship between personality and alcohol consumption (e.g., coping behaviour or control beliefs).

Like the SP motivational pathway, this was the first study to successfully predict alcohol consumption for a SR predisposition with coping, emotional dysregulation, and motivational determinants of alcohol use among a sample of

student drinkers. In keeping with the SP motivational pathway, the SR pathway also accounted for more of the unique variance in alcohol use than those generally reported in the published literature, which also tend to employ smaller numbers of predictors. For example, Pardo et al. (2007) reported that SR scores only accounted for 4% of the unique variance in alcohol consumption scores, after controlling for age of onset. In the Introduction for Chapter 2, it was stated that alcohol misuse is a multiply determined behaviour that is best assessed by multidimensional frameworks like Cox and Klinger's model, because they appear to have better predictive utility, as evidenced by the findings for the SR motivational pathway. Drinkers with a strong BAS might benefit from a motivational education programme that incorporates coping skills training, emotional regulation strategies, and structured goal-setting activities if it helps them to reduce or control their level of alcohol use.

Other Findings

The noteworthy relationships among the demographic variables and alcohol consumption scores, and differences associated with sample characteristics, are outlined next. The findings are discussed in line with Study 1 whenever relevant.

First, the findings for the total number of years in education was not unexpected: those participants who had received fewer years of formal education were found to be consuming more alcohol than their more educated (and also older) counterparts. This finding is consistent with the findings regarding age and alcohol consumption in Study 1. Specifically, younger participants would naturally have received fewer years of formal education than their older counterparts. Thirty-three percent of the sample were aged between 18-19 years ($n = 58$).

Second, there was a clear age-dependent relationship for the age of first drink (AFD) and alcohol consumption scores: those participants who drank alcohol at a younger age were consuming more alcohol than those participants who first drank alcohol at an older age. This finding replicates those of Study 1, showing that early onset drinking is a consistent indicator of drinking behaviour in student samples (e.g., volume of alcohol consumption rather than frequency). As discussed for Study 1, early onset drinking may contribute to excessive drinking in adulthood, alcohol dependence, and alcohol-related problems. This pattern of results was supported by the number of years drinking on a regular basis question. Participants who had been drinking for more years were found to be consuming more alcohol than those participants who had been drinking for a shorter number of years.

The present results showed significant relationships between number of years in education, number of years drinking on a regular basis, and volume of alcohol consumption scores, which were not observed in Study 1. This is possibly because Study 2 used a better alcohol consumption index (TADD), whereas Study 1 used a frequency and quantity measure (AUQ). No relationships were found between sex and alcohol consumption scores, same as in Study 1. This study, unlike Study 1, failed to find a relationship between age and alcohol consumption. Age appears to be an inconsistent indicator of alcohol consumption. In agreement with Cox and Klinger's model and the results of Study 1, the relationships between the demographic variables and alcohol consumption scores were weak in the present study. This would be expected, because demographic variables are deemed to be the most distal determinants of alcohol use.

The gender differences found in this study were as follows. Females scored higher than males on the R-COPE self-help coping behaviour scale. This finding

replicates those of Zuckerman and Cagne (2003), who claimed that females have more of a tendency to use emotional based coping behaviours than males when dealing with stressful situations or problems. This claim is also supported by the findings of Stanton, Kirk, Cameron, and Danoff-Burg (2000), who reported that females were more likely to adopt an emotional approach when dealing with stressful situations or problems than males (e.g., seeking out and forming social networks).

In the present study, females also scored higher on unrealistic control beliefs than males. This result is consistent with the findings of Zuckerman et al. (2004), who reported that the differences between the sexes for control beliefs have become inconsistent of late. They previously found females to score higher on realistic control beliefs and lower on unrealistic control beliefs than males (Zuckerman et al., 1996). The present study found the opposite trend; however, males were under-represented in this study ($n = 29$). The stability of any sex differences on the measures can only be established by replicating the study with a larger, more representative sample of male participants.⁷

The nationality differences found in this study were as follows. Native English speakers scored higher on the SPSRQ SP scale, the DERS goals scale, and alcohol consumption scores than non-native English speakers. Non-native English speakers scored higher on the unrealistic control beliefs scale than native English speakers. The differences in mean scores for native and non-native English speakers on the SPSRQ, DERS, RAUCB, and TADD could be due to three plausible reasons. First, the non-native English speakers may have experienced conceptual (language) problems whilst

⁷ The ratio of male to female participants in this study and Study 1, although unbalanced, is nevertheless consistent with the ratios for undergraduate students at Bangor University.

completing the measures, in that they may not have fully understood the meaning of the items on the measures. Second, the variations in mean values may be due to cross-cultural differences. This researcher is unaware of any published studies regarding the cross-cultural stability of the four measures; however, cross-cultural differences cannot be fully excluded because they are evident on the TADD derived alcohol consumption scores. The mean value for the native English speakers score was found to be more than twice that of the non-native English speakers ($d = 1.16$, large effect). Third, the non-native English speakers were under-represented in this study ($n = 25$). The stability of any cross-cultural differences on the measures can only be established by replicating the study with a larger, more representative sample of non-native English speakers.

Conclusions

The main correlations with alcohol consumption were: sensitivity to punishment, sensitivity to reward, emotional dysregulation, approach motivational structure, enhancement and coping alcohol use motives, and negative consequences motives for abstaining from alcohol. The structure of the correlations was used to identify five partial mediators of alcohol consumption; of these five, two partial mediations were found for the RST punishment personality dimension and three were found for the RST reward personality dimension. These findings indicated that the personality predictors influenced the criterion both directly and indirectly through the mediating variable. The structure of the correlations was used to identify two distinct motivational trait profiles that may contribute to excessive alcohol use for emotional regulation and reinforcement reasons. One pathway was marked by a weak BIS, maladaptive coping behaviour, emotional dysregulation, coping alcohol use motives,

and negative consequences motives for abstaining from alcohol. In principle, this pathway may be envisaged as being a ‘negative reinforcement motivational pathway’ that is associated with alcohol misuse. The other pathway was marked by a strong BAS, poor adaptive coping and strong maladaptive coping behaviours, emotional dysregulation, coping and enhancement alcohol use motives, and negative consequences motives for abstaining from alcohol. In a similar manner, this pathway may be envisaged as being a ‘positive reinforcement motivational pathway’ that may also be associated with alcohol misuse.

Methodologically, the study employed a cross-sectional sample of social drinking students who completed self-report measures. Although no directionality can be claimed, the results are consistent with the findings of Study 1 and the published studies that used student, community, and clinical samples to test singular constructs of alcohol misuse (e.g., personality and alcohol-specific drinking motives). Furthermore, according to MacKinnon, Fairchild, and Fritz (2007), observed regression approaches to mediation cannot claim casual inference, because of the correlational nature of the procedure. For example, when measurements of X, Y, and M are made at the same time, there are other models that can fit the data. Although no causal direction can be claimed for the mediations, the mediational relationships were predicted and theoretically derived from Cox and Klinger’s model, and are consistent with the theoretical underpinnings of Cox and Klinger’s model and RST. Hence, the determinants of alcohol use employed in this study are considered to be reliable, valid, and robust. In doing this, this study offers further support to the theoretical underpinnings of RST and the predictive ability, validity, reliability, and utility of the motivational model of alcohol use.

The findings for motivational structure and each motivational pathway are important, because they highlight that drinkers with a weak or strong BIS predisposition and those with a strong BAS predisposition might benefit from motivational education programmes that include coping skills training, emotional regulation strategies, and structured goal-setting activities. These training components may enable excessive drinkers to reduce or control their alcohol use and increase their general levels of self-competence and self-esteem. They might also help excessive drinkers to attain non-alcohol related goals that may be an alternative source of self-reinforcement. The findings might also benefit the design of prevention, harm-reduction, treatment, and relapse-prevention programmes for student, community, and clinical clients if they facilitate better outcomes. In sum, the study achieved its primary aims by establishing the associations between personality, emotion, motivation, and alcohol use for negative and positive reinforcement reasons. It is the personality, emotion, and reinforcement aspects of alcohol use that are the focus of Chapter 6.

CHAPTER 6

Effects of Induced Mood on the Motivation to Drink

Motivational theories of addiction have stipulated that personality, affective regulation, and alcohol reinforcement are important determinants of a person's decision to drink. Personality determinants are reviewed in Chapters 2 and 3, and the affective regulation determinants are reviewed in Chapter 4 of the present thesis; the role of alcohol reinforcement is discussed in this chapter. Motivational theories of substance misuse have been interested in the reinforcing properties of drugs and alcohol for many years (e.g., Conger, 1951; 1956; Jellinek, 1960). Many learning and conditioned reinforcement theories have been developed to account for either the negative or positive reinforcement aspects of substance misuse, or both (see Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Lewis, 1990, 1996, Solomon 1977).

Using substances for self-reinforcement is considered to be a risk factor for excessive or problematic drinking and relapse after detoxification and treatment; the examples of this include drinking to reduce withdrawal symptoms, drinking to reduce negative emotionality, and drinking to satisfy alcohol urges, cravings, and expectancies. The pertinent conditioned reinforcement models are reviewed in the alcohol reinforcement section of this chapter (e.g., tension-reduction hypothesis). According to Marlatt and Gordon (1985), the engagement in addictive behaviours typically provides immediate rewards that either increase pleasure or reduce negative emotional states like pain, distress, and discomfort. Hence, people will decide to drink to "feel good" or "feel better" in Marlatt and Gordon's words. The roles that personality, affective regulation, and alcohol reinforcement motivation play in the

decision to drink need to be established in alcohol users through direct and indirect measures of alcohol use in a controlled laboratory setting (e.g., an alcohol-taste test with self-report measures of alcohol reinforcement, respectively). This chapter presents an overview of some of the experimental methodologies for doing this, alongside theoretical approaches.

Alcohol reinforcement and Gray and Smith's arousal-decision model (see Chapter 2) is reviewed first, because mood-inductions and taste-tests are often used to study the reinforcement aspects of alcohol. The remainder of the chapter presents reviews of personality and emotional reactivity, in order to establish that mood-induction procedures (MIPs) are a viable technique for causing transient changes in affective state among participants with sensitivity to punishment or reward. Then it reviews single-method MIPs, combined MIPs, MIPs in addictive behaviours research, mood-inductions, and taste-tests. The next part of the chapter reviews alcohol reinforcement mechanisms.

Alcohol Reinforcement Mechanisms

This review addresses the most pertinent theories or models of conditioned alcohol reinforcement. The terms alcohol and drugs are used interchangeably throughout this review, because the results from studies on drugs along with alcohol indicate that the same principles apply to both.

General Learning Principles

Alcohol use can be conceptualised as a learned behaviour (e.g., Social Learning Theory; Maisto, Carey, Bradizza, 1999). People may learn to use drugs through two basic learning mechanisms, classical (Pavlovian or respondent) conditioning and operant (or instrumental) conditioning. Appetitive classical conditioning can occur when a previously neutral stimulus is reliably paired with another stimulus that elicits a certain behaviour (Lewis, 1990). For example, alcohol elicits drinking and is reliably paired with the sight of bottles, glasses, smell, and so on. The latter stimuli are termed alcohol-related cues. An example of an appetitive classically conditioned response is the onset of alcohol cravings or urges in response to alcohol-related cues, in the absence of alcohol itself (e.g., Franken, 2002).¹

Operant conditioning occurs when behaviours are shaped by their consequences. Hence, positive reinforcers or rewards are likely to increase the frequency of behaviours which precede them, and negative reinforcers or punishers are likely to cause a decrease in the frequency of behaviours which precede them, in specific situations (Lewis, 1990, 1996). It can be argued that all drugs (e.g., alcohol, nicotine, caffeine, sugar, and chocolate) are used for their positive reinforcing effects, and that their use is maintained through reward operant conditioning. For example, if

¹ Cravings can be defined as the preoccupation with obtaining the substance of abuse (Love, James, & Willner, 1998). Cravings can also be said to represent the subjective motivational-emotional states that activate drug-seeking (Feldtkeller, Weinstein, Cox, & Nutt, 2001). Models of alcohol cravings can be classified along the negative and positive reinforcement dimensions of alcohol-seeking and alcohol-use (Willner et al., 2005)

the effects of consuming alcohol in a particular setting are generally positive, a person will be more likely to drink on future occasions, and vice versa.

Reinforcement Principles

It has been long established that drinking alcohol is reinforcing for a variety of reasons (e.g., past reinforcement, conditioned reactions to alcohol, net benefits from drinking alcohol, and direct and indirect effects in Cox & Klinger's model, reviewed in Chapter 2). Reinforcement can occur if a person repeats behaviours which result in a positive outcome or the alleviation of a negative outcome. Physiological and psychological alcohol reinforcement stimuli can initiate alcohol-seeking in social, escape, and alcohol-dependent drinkers. They are also associated with alcohol cravings or urges, alcohol use motives, alcohol expectancies, and alcohol relapse behaviours among recently detoxified drinkers (see stress-vulnerability hypothesis; Brown, Vik, Patterson, Grant, & Schuckit, 1995). For example, coping alcohol use motives are sometimes termed negative reinforcement motives for drinking that mediate the relationship between personality and alcohol consumption (see Chapters 2 and 4).

There are two kinds of alcohol reinforcement, positive and negative. Positive reinforcement occurs when a reinforcer initiates behaviours that move a person closer to obtaining the effect of the reinforcer or reward (Lewis, 1990, 1996). Negative reinforcement occurs when a reinforcer initiates behaviours that move a person away from a source of distress or remove an aversive effect (e.g., alleviate the negative emotionality associated with anxiety, depression, and Post-Traumatic Stress Disorder). Negative reinforcement can also occur when an alcohol-generated aversive state is alleviated by more drinking (e.g., dependent drinkers' reducing the negative

aspects of withdrawal by consuming more alcohol). Both kinds of reinforcement are defined by the effect of a stimulus (or reinforcer) that increases the likelihood that a behavioural response will recur (Lewis, 1990).

Comparative psychology has established alcohol reinforcement effects in mice, rats, monkeys, and baboons (e.g., Deneau, Yanagita, & Seevers, 1969). The findings from these studies are not reviewed in this chapter, which considers only human models.

Models of Reinforcement

Early studies established the associations between reinforcement mechanisms and alcohol consumption. Conger (1951, 1956) concluded that people drink alcohol to induce pleasurable psychological changes and to relieve anxiety (Tension-Reduction Hypothesis). This premise is comparable to only one part of Cox and Klinger's model—that a person will decide to drink to reduce negative affect. Conger's tension-reduction model holds that a state of tension is the motivator for action and negative reinforcement is the mechanism that turns the internal drive state into action (Greeley & Oei, 1999). Another alternative explanation is the Stress-Response Dampening Model (SRD; Sher & Levenson, 1982), considered by most researchers to be an offshoot of Conger's model rather than a reconceptualisation. The SRD model focuses its attention upon individual differences in response to alcohol's stress-response dampening effects (Greeley & Oei, 1999). In agreement with this, Conrod and colleagues found that individual differences in sensitivity to alcohol reinforcement were related to volume of alcohol consumption and frequency of excessive consumption (Conrod, Petersen, & Pihl, 1997).

The common tenet in both models is the negative reinforcement anxiety-reducing properties of alcohol. Both models have been extensively investigated; the findings appear to be better for the stress-response dampening model than the tension-reduction model. It is generally accepted that negative reinforcement effects are strongest in approach-avoidance conflicts, especially in approach-avoidance conflicts where SRD effects of alcohol satisfy the conditions for intermittent reinforcement (see Powers & Kutash, 1985). In intermittent reinforcement schedules behaviours are reinforced only some of the time. These type of reinforcement schedules have been shown to generate and maintain very high rates of responses, which are resistant to extinctions; they may maintain some forms of compulsions and addictions (e.g., gamblers who win intermittently when placing a bet on a horse race might continue to bet even if they tend to lose more money than they win).

Later studies have established that alcohol can function as a reinforcer (e.g., Cox & Klinger, 1990, 2004; Field & Duka, 2002). Lewis (1990) claimed that the effects of alcohol cause a drinker to initiate alcohol-seeking activities and drink again. He went on to state that the effects of alcohol can be positive and euphoric; these effects can lead to reinforcement through reward mechanisms, and result in more drinking episodes. In a similar manner, alcohol can also have anxiety-reducing effects because it can be used to reduce levels of distress or discomfort. According to Lewis (1990, 1996), the negative reinforcement aspects of alcohol use can be as equally rewarding as the positive reinforcement aspects of alcohol use. As stated in Chapter 2, the direct or indirect effects of alcohol tend to be short-lived and have very little benefits (e.g., they do not make the source of the distress or discomfort go away, in the long-term they tend to make it worse). Greely and Oei (1999, p. 25) claimed that

alcohol's effects on distress and discomfort can sometimes reduce it, sometimes increase it, or produce no changes at all.

Farber, Khavari, and Douglass (1980) stated that people drink for social (positive reinforcement) and escape (negative reinforcement) reasons. Escape drinking is usually deemed to be the most risky option in terms of developing alcohol-related problems. These authors suggested that 93% of the alcohol dependent drinkers in their sample would be classified as escape drinkers ($N = 2496$).

Clearly, alcohol reinforcement is not a simple process. However, the published studies tended to examine only one of its aspects (either positive or negative). The present researcher posits that it is important to study both the positive and negative aspects of alcohol reinforcement when using experimental paradigms to establish the determinants of alcohol use (e.g., alcohol-taste tests or beverage-taste tests), because some drinkers may drink for negative reinforcement reasons, others may drink for positive reinforcement reasons, and some may drink for both kinds of reasons. For example, Study 2 of the present thesis found that coping (negative reinforcement) and enhancement (positive reinforcement) alcohol use motives scores were associated with sensitivity to reward scores. Coping and enhancement motives partially mediated the relationship between sensitivity to reward and alcohol consumption scores, but only enhancement alcohol use motives (positive reinforcement reasons for drinking) predicted alcohol consumption scores in the SR motivational pathway. Conversely, coping alcohol use motives scores were found to be associated with sensitivity to punishment scores; they also partially mediated the relationship between sensitivity to punishment and alcohol consumption scores. Coping alcohol use motives were also found to be a good predictor of alcohol consumption in the SP motivational pathway.

These findings indicated that sensitivity to punishment is more strongly associated with escape drinking than sensitivity to reward.

Therefore, in the final experiment of the present thesis, positive and negative alcohol reinforcement motivations have been assessed; it was expected that similar relationships with the personality variables would be observed. In addition, more specific predictions have been made about the effects of mood-induction on alcohol consumption in the taste-test (see Chapter 7).

Neuropharmacological Perspectives of Drug Reinforcement

In Chapter 2, it was stated that this thesis aims to integrate findings from diverse areas of psychological research. This is certainly necessary for understanding the reinforcement effects of alcohol, because alcohol reinforcement can be the result of psychological process (e.g., personality, emotion regulation, and alcohol-specific motivations), behavioural process (e.g., habitual alcohol-seeking behaviours and actions), and neuropharmacological process (e.g., alcohol's effects on the brain's reward pathway, neurotransmitters, and neural substrates). The present researcher considers these aspects to be interrelated.

Neuropharmacological theories such as Koob and Moal's Allostasis Model have greatly advanced the understanding of drug reinforcement principles (see also Kreek & Koob, 1998). Allostasis is the process by which substance users attempt to maintain the apparent reward functions of substances through causing changes in the brain's reward mechanisms (Koob & Moal, 2001, p. 97). The allostasis model also accounts for secondary positive and secondary negative reinforcement processes. Secondary positive reinforcement effects can occur through conditioned positive reinforcement (e.g., when neutral stimuli are paired with the positive reinforcing

effects of drugs). Likewise, secondary negative reinforcement effects can occur through the removal of the conditioned negative reinforcing effects of conditioned abstinence (Koob & Moal, 2001). The advocates of this model also claim that positive reinforcement is more associated with binge drinking and that negative reinforcement is more associated with negative affect and withdrawal states. Positive and negative reinforcement form the preoccupation and anticipation stage of Koob and Moal's addiction cycle model. The preoccupation component is associated with alcohol cravings and urges, and the anticipation component is associated with alcohol expectancies. Positive and negative alcohol expectancies can be defined as the anticipated consequences of alcohol use (see Brown, Goldman, Inn, & Anderson, 1980; Cox & Klinger, 2004).

Another salient account of drug reinforcement principles is the Incentive-Sensitisation Model (Robinson & Berridge, 1993). This model also advocates that compulsive drug-seeking and drug-taking are motivated by the desire to obtain pleasurable effects or alleviate negative states. It goes on to claim that the psychological process of incentive salience is responsible for operant drug-seeking and drug-taking. Incentive salience is mediated by the sensitisation of brain structures as a result of continued exposure to addictive substances (see Solomon, 1977; Willner et al., 2005). According to Robinson and Berridge, drugs of abuse sensitise the incentive salience pathways and not the pleasurable effects sensitisation pathways. This sensitisation causes increases in “wanting” or cravings for drugs and decreases in “liking” the pleasurable effects of drugs. However, Willner et al. (2005) reported that both wanting and liking increased as a function of dependence on amphetamine and likewise with alcohol consumption. They concluded that Robinson and Berridge's claim about the increase in wanting and decrease in liking is incorrect, and that there

is little evidence to support the disassociation between the wanting and liking of drugs. This point was previously acknowledged by Robinson and Berridge (1993), who stated that there is very little evidence linking the escalation in dose with the tolerance of drugs (Willner, James, Morgan, 2005, p. 1488).

An alternative model was proposed by Fromme and D'Amico (1999, p. 442); they claimed that there are two neuroanatomical and neurochemical reinforcement pathways that mediate the psychological effects of alcohol. One pathway is associated with dopamine, opioid peptides, and GABA; this pathway is believed to be responsible for the positive and negative reinforcing effects of alcohol and the development of tolerance to alcohol's effects. The other pathway is associated with serotonin, glutamate, and norepinephrine; this pathway is believed to be responsible for the deficits in cognition and impaired learning that are associated with alcohol-seeking behaviours without reinforcement. Drugs of abuse (alcohol, amphetamines, barbiturates, benzodiazepines, caffeine, cocaine, opiates, and nicotine) can affect neurotransmitters and cortical substrates. Alcohol can produce euphoria and disinhibition; it can also reduce anxiety when consumed at lower doses, and cause sedation and coma when consumed at higher doses (Koob & Moal, 2001).

Studies have found associations between neuronal dopamine release and the reinforcing effects of alcohol. Dopamine systems are generally believed to contribute to the mediation of alcohol's reinforcing effects, especially in the reward pathways (e.g., Fromme & D'Amico, 1999; Kapusta et al., 2007). Spanagel and Weiss (1999) proposed that dopamine neurons play an important role in the learning of behaviours that are reinforced by rewarding drug-stimuli. This point becomes even more salient when the neural substrates and functions of the BAS are considered (see Chapter 2). For example, in a study of negative and positive reinforcement, Hewig and colleagues

found that high BAS scores were associated with higher bilateral cortical activity for positive and negative reinforcement cues as compared to neutral cues (Hewig, Hagemann, Seifert, Naumann, & Bartussek, 2006). Both types of reinforcement cues appear to be rewarding to people with a strong BAS.

Alcohol is thought to exert its effects on the reward pathways by acting on the ventral tegmental area, nucleus accumbens, and amygdala (the brain areas that form the reward pathways). All three of these brain areas form part of the neural substrates for the BAS. So, it can be proposed that the BAS is not just associated with the neurochemical and anatomical aspects of alcohol reinforcement, but the psychological (e.g., memory) and behavioural processes of alcohol reinforcement as well.

Besides dopamine, alcohol also affects levels of opioid peptides, serotonin, GABA, and glutamate. The anti-punishment and anxiolytic effects of alcohol are associated with the facilitation of GABA receptors and the inhibition of glutamate receptors (see Fromme & D' Amico, 1999; Koob & Moal, 2001). As reviewed in Chapter 2, the neural substrates of the BIS are the septo-hippocampal system, orbitofrontal cortex, and memory-related cortical regions (e.g., Papez circuit). The Papez circuit is one of the major pathways of the limbic system and it is primarily involved in the control of emotion and memory storage. The orbitofrontal cortex is associated with compulsive and repetitive drug-abuse. Abnormal activation of the orbitofrontal cortex is responsible for compulsive drug-abuse, even when people have become tolerant to the pleasurable effects of drugs and experience adverse consequences from drug-abuse (Volkow & Fowler, 2000). Loxton and colleagues have proposed that rash impulsivity is associated with individual differences in the functioning of the orbitofrontal and ventromedial prefrontal cortex areas of the brain; these areas are associated with impulsive-control (Dawe, Gullo, & Loxton, 2004;

Loxton, Nguyen, Casey, & Dawe, 2008). The ventromedial prefrontal cortex is associated with the processing of fear and risk, it might also be associated with decision-making processes in certain and uncertain situations (Fellows & Farah, 2007). Hazardous drinkers, who suffer negative consequences from disinhibited behaviours, are likely to have an inhibition deficit that may be the result of abnormal activation in the orbitofrontal and ventromedial prefrontal cortex. The functions of these brain areas are influenced by GABA and serotonin. The same anatomical regions and neurotransmitters that are involved in the activities of the BIS. Again, this point becomes even more salient when the neural functions of the BIS are considered (e.g., orbitofrontal cortex). So, it can be proposed that, like the BAS, the BIS is not just associated with the anatomical and neurochemical aspects of alcohol reinforcement, but the psychological and behavioural processes of alcohol reinforcement as well.

RST Account of Alcohol Reinforcement

In the RST literature, the activities of both the BIS and BAS are said to be related to drug-seeking and drug-abuse activities. The associations may be made through learning (appetitive classical and reward operant conditioning) and maintained through reinforcement mechanisms (positive or negative). Drugs of abuse can mimic the action of natural reinforcers in the BAS (e.g., food and sex) and reduce the action of anxiogenic (anxiety inducing) aversive stimuli in the BIS. These effects are not considered to be mutually exclusive because the BAS and BIS are inhibitory of each other. An increase in BAS activity would cause a secondary decrease in BIS activity, and a decrease in BIS activity would cause a secondary increase in BAS

activity. Both forms of inhibition can result in disinhibited or uncontrolled drug-seeking and drug-use (see Powell et al., 1991).

Some drugs of abuse might exert their primary effects on both the BAS and BIS. For example, alcohol and cocaine can cause dopamine release from neuron terminals in the nucleus accumbens; in doing so they are mimicking the actions of natural positive reinforcers in the BAS (Powell et al., 1990). According to Gray (1982), alcohol is a psychotropic drug that can dampen the activity of the BIS and mimic the actions of positive reinforcers in the BAS. Hence, alcohol is a drug whose primary effects are experienced in both the BAS and BIS for psychological, behavioural, and neuropharmacological reasons.

The final experiment in the present thesis was designed to examine the relationships between BIS and BAS activity and alcohol reinforcement. The specific predictions regarding this and other variables—taste-test, mood-induction, expected and perceived reward—are stated in Chapter 7. The last two variables were included to assess the incentive value of alcohol. A brief summary of the relevant literature on the arousal-decision model and comparators is presented next (see Chapter 2 for a fuller review).

Arousal-Decision Model and Comparators

The arousal-decision model assigns roles to reward and punishment comparators that evaluate actual and expected reinforcement, because people have unique expectancies regarding the relative strength of rewarding and punishing stimuli. The actual reinforcement value is compared with the expected reinforcement value to determine (1) whether a reward or punishment was subjectively received by the person, and (2) the direction and strength of the reaction to the reinforcement

(Corr, 2001). Corr (2001, 2002) proposed that these two factors need to be dealt with when designing experimental paradigms that employ rewards and punishers, because they can increase systematic error or bias, and confound the results. For example, a person with a strong BAS may expect more reward than the experimental paradigm delivers and thus perceive the experimental paradigm as aversive, which can result in frustrative nonreward. Frustrative nonreward is mediated by the BIS and not the BAS; although it is a response initiated by BAS reward expectancies and sensitivity (Corr, 2002). Strong BAS participants will be the first to identify that frustrative nonreward occurred during an experimental paradigm, when the reward is lower than expected (Corr, 2001, 2002). In a similar manner, a person with a strong BIS might expect more punishment than the experimental paradigm actually delivers and as thus perceive the experimental paradigm as appetitive. Strong BIS participants might be the first to identify that nonpunishment occurred during an experimental paradigm, when the punishment is lower than expected.

Therefore, the present researcher considers it necessary that researchers should take measurements of subjectively-defined expectancies and reinforcement values, so a subjective-perceived value for manipulated reinforcement can be estimated (see Corr, 2001, p. 340). Indeed, RST researchers have started to assess the subjectively defined expectancies and reinforcement values of alcohol stimuli (Kambouropoulos & Staiger, 2004). This is an important issue because it is generally accepted that alcohol has a positive or negative incentive value that can motivate abstainers, social, or escape drinkers to engage or not engage in alcohol use for reinforcement reasons (e.g., Cox and Klinger, 1990, 2004; Field & Eastwood, 2005).

Kambouropoulos and Staiger (2004b) assessed pre-experimental expected subjective reward for alcohol presentation at baseline before exposing participants to

a cue-reactivity paradigm. After the participants had completed the experiment, they were asked to complete a measure of actual subjective perceived reward (post-experimental). These authors claimed that these two measurements met Corr's criteria and allowed them to estimate heightened subjective reward for the presentation of alcohol. Heightened subjective reward was calculated by subtracting the pre-experimental from post-experimental scores (perceived – expected). They found that participants in the drink condition scored higher on heightened subjective reward than those in the no drink condition, and concluded that for regular social drinkers the drink condition was more rewarding than the no drink condition, which was rated as being more punishing. Furthermore, sensitivity to reward was found to be positively associated with cue-elicited positive urge to drink. The present researcher concurs with Kambouropoulos and Staiger (2004b) that it is important to independently assess participants' subjective perceptions of alcohol's rewarding qualities. This will be done in final experimental study of this thesis (see Chapter 7). The next part of this chapter reviews personality and emotional reactivity during mood-inductions, before focusing its attention on the experimental techniques for studying the reinforcing effects of alcohol (e.g., MIPs combined with taste-tests).

Personality and Emotional Reactivity

Most personality theorists are interested in the strong association between personality and emotion, mood, or affect (the terms are used interchangeably in the published literature), because these determinants can shape motivation and drive behaviour. Traditionally, the BIS or neuroticism has been associated with negative affect and the BAS or extroversion has been associated with positive affect (see Chapter 4). According to Tellegen (1985), neuroticism should be termed negative

emotionality and extroversion should be termed positive emotionality. Tellegen also stated, “personality and psychopathology reflect the influence of distinctive and pervasive positive and negative affect systems that give rise to both intra-individual variations in emotional state and inter-individual differences in emotionality” (quoted by Quilty & Oakman, 2004, p. 560). Tellegen concluded that the same rotations in Eysenckian factor space that result in Gray’s BIS and BAS dimensions also form the axes for negative and positive emotionality. Hence, neuroticism, BIS sensitivities, and negative emotionality are similar in Tellegen’s terms, so are extroversion, BAS sensitivities, and positive emotionality. Quilty and Oakman (2004) tested Tellegen’s claims in a confirmatory factor analysis study with a large sample of university students. They concluded that positive emotionality was a good indicator of BAS activity, but it should be viewed as being a separate and interrelated construct. They went on to note that not all components of positive emotionality are associated with BAS activity, and emphasised that the BAS is also associated with negative emotionality and constraint. Constraint in Tellegen’s terms is said to represent individual differences in self-regulatory style (self-regulation is defined Chapter 4).

Some researchers adhere to Tellegen’s unipolar classification of personality and emotion (e.g., neuroticism and negative affect or extroversion and positive affect), but under some situations the relationships can become bipolar. For example, when participants with a strong BAS are insulted, they are more likely to show elevated left-prefrontal cortical activation and behave in an angry and aggressive manner than those participants with a weak BAS (Harmon-Jones & Sigelman, 2001). In a later study, Harmon-Jones (2004) concluded that anger, cognitive dissonance, and emotions that have a negative emotional valence are associated with greater left-frontal activity in the approach-motivational system (BAS). In a similar manner,

Cooper and colleagues found that BIS scores were associated with the internalisation of anger, and that BAS scores were negatively associated with the control of angry feelings. They also found that both BIS and BAS scores predicted anger arousal, whereas BAS fun seeking scores predicted aggressive responses to anger based scenarios, and BIS scores predicted internalised anger responses (Cooper, Gomez, & Buck, 2008). Carver (2004) reported that sadness and anger were more associated with variations in BAS sensitivity than with BIS sensitivity. Frustrative nonreward, a response that is generated by the BAS but mediated by the BIS, can also produce anger and frustration responses—for example if the person receives a lesser reward than the one expected for accomplishing the appetitive task or goal (Corr, 2001). Thus, not all classes of negative emotions are associated with neuroticism and the avoidance-motivational system (BIS). Researchers need to be aware of this when they are designing experimental paradigms based on the relationships between personality and emotion along Tellegen's unipolar dimensions, because they could obtain misleading results.

A number of researchers have proposed that certain personality types are more susceptible to a particular kind of emotional state than other personality types. Larsen (1989, 1997, 1999) was one of the first to test this premise in student samples. He tested the associations between Eysenck's, Gray's, and Cloninger's personality dimensions and positive and negative affect in a series of mood-induction studies. One of the studies predicted that extroverts would experience greater positive affect after being exposed to signals of reward than introverts; neurotics were predicted to experience greater negative affect after being exposed to signals of punishment and frustrative nonreward than stable participants (Larsen & Ketelaar, 1989). The results supported these hypotheses. Larsen and Ketelaar concluded that extroversion and

neuroticism represent specific vulnerabilities to particular affective states, namely, positive and negative, respectively. The implications for the present research were as follows: If mood states are induced in a laboratory setting, a person with a strong BAS would be expected to be more susceptible to a positive mood-induction, whereas a person with a strong BIS should be more susceptible to a negative mood-induction.

Larsen and Ketlaar's earlier premise was supported by their later findings with an imagination mood-induction procedure (Rusting & Larsen, 1997). Zelenski and Larsen (1999, p. 761) found a similar pattern of results when establishing the relationships between Eysenck's, Cloninger's, and Gray's personality dimensions and differences in emotional state with a pictorial mood-induction. Overall, reward sensitivity predicted positive emotions and not negative emotions, whereas punishment sensitivity predicted negative emotions and not positive emotions. It was concluded that the traits that predict emotional susceptibility in the laboratory also predict emotional experiences in the real world. Participants were asked to complete a report form that assessed their mood, activities, self-esteem, environmental interactions, physical symptoms, and mood regulation strategies on a day-to-day basis. Zelenski and Larsen reported that there was consistency across the scores for the different study methodologies (laboratory mood-inductions and self-report real-life measures). Specifically, reward sensitivity predicted increased pleasant affect and increased activated pleasant affect scores for the daily report form. Likewise, punishment sensitivity predicted increased unpleasant affect and increased unactivated unpleasant affect for the daily report form.

Another study that employed a mood-induction procedure to deliver rewards or punishments whilst participants performed a go/no-go task, showed the theoretical associations between neuroticism, impulsivity, and positive and negative affect that

were derived from Eysenck's, Gray's, and Newman's models of personality (Gomez, Cooper, & Gomez, 2000). Newman's model is considered to be synthesis of Eysenck's and Gray's model (e.g., Newman, Patterson, & Kosson, 1987). In short, Newman's model holds that the BAS reflects high extroversion and that the BIS reflects high introversion. The mood states that are mediated by the BAS and BIS are deemed to be those that are aligned with Gray's model (e.g., positive and negative affect, respectively). Hence, in agreement with Eysenck's model, Newman's model predicts that high extroversion is associated with sensitivity to reward and positive affect, whereas high introversion is associated with sensitivity to punishment and negative affect. The models differ when it comes to defining the functions of neuroticism. Newman claims that neuroticism reflects the activities of Gray's Non-specific Arousal System (NAS) and that it mediates both the BAS and BIS (see Wallace, Newman, & Bachorowski, 1991). The NAS is now termed the Fight-Flight-Freeze System (FFFS) and is reviewed in Chapter 2. Newman was trying to establish that, when the NAS or FFFS mediates neuroticism, it causes impairments in response modulation that result in anxious-impulsivity. In other words, Newman was trying to identify the cause of impulsiveness in anxious people.²

Gomez et al. (2000) found that the negative mood-induction scores were predicted by neuroticism and an extroversion-neuroticism interaction, whilst positive mood-induction scores were predicted by extroversion only. In general, the findings

² Impulsivity or disinhibition in RST terms can be caused by an inhibition deficit that is the result of a strong BAS and normal BIS, or a normal BAS and weak BIS, or a strong BAS and strong BIS. There is not much evidence to support Newman's claims. In fact, anxious-impulsivity in RST terms is more associated with a strong BAS and a strong BIS, because the BAS would dominate the BIS. The disagreements between Gray's and Newman's models have never been resolved satisfactorily.

are consistent with Larsen's; thus anxiety and impulsivity predicted negative and positive mood-induction, respectively.

To conclude, it was predicted that sensitivity to reward would be more associated with positive affect, and that participants with a strong BAS would be more susceptible to rewards in a positive mood-induction condition than those with a weak BAS. On the other hand, sensitivity to punishment was expected to be more associated with negative affect, and participants with a strong BIS were expected to be more susceptible to punishers in a negative mood-induction condition than those with a weak BIS. It remains to be established how participants with a strong BIS will respond to rewarding cues like alcohol in a negative mood-induction condition. This is one of the questions that the final study in this thesis, presented in the next chapter, was designed to answer. On the basis of the results reviewed here and in the previous chapters, it was predicted that participants with a strong BIS, when subjected to a negative mood-induction, would consume more of an alcoholic beverage to alleviate negative emotional states than would the weak BIS participants. Conversely, it was predicted that participants with a strong BAS, when subjected to a positive mood-induction, would consume more of an alcoholic beverage to maintain or enhance their positive affect than would the weak BAS participants. The next study, will measure only the amount they drank—not the reason why they drank the amount that they did.

Mood-Induction Procedures

Two reviews have evaluated the effectiveness of mood-induction procedures (MIPs; see Martin, 1990; Westermann, Spies, Stahl, & Hesse, 1996). MIPs are used to cause transient changes in affective state in a laboratory setting. MIPs are usually used to investigate the associations between emotion, cognition, and behaviour in student, community, and clinical samples. Some MIPs have been designed to induce a negative or positive emotional state (e.g., threat MIPs and gift MIPs, respectively), whereas others have been designed to induce negative, positive, and neutral emotional states (e.g., autobiographical memories, music, imagination, and recollection MIPs). The singular and combined MIP procedures are briefly reviewed and evaluated next.

Single-Method MIPs

The following procedures have been found to be effective in changing participants' mood states and are listed here in alphabetical order.

Autobiographical Memory

Autobiographical memory is a type of MIP that is designed to elicit affectively-valenced memories. According to Bernstein and Rubin (2002), affective experiences tend to form durable autobiographical memories, which leave long lasting memory traces that are easily recalled. There are numerous procedures for eliciting mood-congruent memories. In the original procedure, Brewer, Doughtie, and Lubin (1980) asked participants to close their eyes and recall three events that made them feel lonely, rejected, defeated, or hurt (Martin, 1990, p. 673). This procedure was modified by Bartlett, Burleson, and Santrock (1982), who asked participants to recall

an experience that made them feel sad or happy, and then to form a picture in their mind of the event or experience, whilst recalling what happened, and how they felt. Participants can also be asked to self-report the experience, how they felt, and how they responded, to increase the intensity of the procedure and target-mood. This form of MIP has been used in studies with children, adults, students, and clinically depressed patients. It is considered to be an effective MIP, which can be used to induce different mood states in a laboratory setting.

Empathy

This form of MIP asks participants to listen to affectively-valenced tape-recorded stories (or a story) and become emotionally involved with the stories (or story). For example, a story may inform a participant that a close friend has become ill and has been diagnosed with an incurable illness. The tape-recorded story focuses upon the participant's friend's feelings of helplessness, loneliness, and despair (see Martin, 1990). These MIPs are not suitable for inducing a positive mood state (see Westermann et al., 1996).

Experimentally Task Related MIPs

One of the simplest ways to induce mood experimentally is to give false verbal and electronic feedback whilst the participant completes a go/no-go task (see Gomez et al., 2000). This can be done for positive (or rewarding) or negative (punishing) conditions. Dougherty, Mathias, Marsh, and Jagar (2005), have designed a number of computer tasks for assessing RST sensitivities that could be used to induce positive or negative mood states in punishment or reward orientated

participants by providing false or correct feedback (e.g., immediate versus delayed visual memory task; also see Feedback MIP section, below). This type of MIP can be effectively used to induce positive and negative mood states in a laboratory setting.

Facial Expression

This form of MIP is based on Leventhal's (1980) Facial Feedback Hypothesis. Experimenters manipulate the facial expressions on participants' faces to induce mood states. Participants are given instructions on how to contract and relax the different facial muscles to produce various facial expressions (e.g., a frown, or a smile, or a disgusted face, or a neutral face). Participants are deceived about the true nature of the procedure by informing them that the experiment is measuring muscular activity whilst they perform certain experimental paradigms (see Laird, Wagener, Halal, & Szegda, 1982; Martin, 1990; Westermann et al., 1996). These MIPs have been used to induce different mood states.

Feedback

Personalised feedback during the completion of an experimental paradigm can be used to induce mood. It is generally accepted that the delivery of false positive or false negative feedback whilst the task is being completed can affect performance. This type of MIP is usually delivered whilst participants complete cognitive-motivational-emotional paradigms like perceptual motor skills tasks, intelligence tasks, risk and decision-making tasks, performance and achievement tasks, and unsolvable puzzle or anagram tasks. Some feedback MIPs provide the correct performance feedback to enhance the impact of the procedure on the target-mood (see

Larsen & Ketelaar, 1989; Martin, 1990; Westermann et al., 1996). These MIPs have been used to induce positive and negative moods in a laboratory setting.

Film and Story

These procedures present participants with narratives or descriptive material that are also designed to stimulate imagination. Participants are asked to identify themselves with the protagonist of a film or story (e.g., place themselves in the shoes of the protagonist). Film and story MIPs tend to employ stimuli that vary in complexity; they can use low affective impact films clips, stories, or scenarios, or high affective versions of the same stimuli. These MIPs are delivered with and without explicit instructions. In the explicit instruction version, participants are asked to imagine and get involved in the story or scenario so they can experience the feelings associated with the stimulus (see Martin, 1990; Westermann et al., 1996). These MIPs are best suited for inducing positive and negative mood states in a laboratory setting.

Gift

This MIP is simple to deliver; participants are usually given a predetermined rewarding gift by the experimenter (e.g., a chocolate bar). It is believed that when people are given an unexpected gift they are delighted to receive it. Participants are usually given the gift and told that it is a token of the experimenters' appreciation for their participation in the experiment (see Westermann et al., 1996). A possible criticism is that this MIP assumes that everyone responds equally to the same rewarding gift; this can be corrected by offering participants a choice from a selection

of gifts. The present researcher considers that a low-rewarding trivial gift could be used to induce a negative mood state in participants, especially if they are expecting to receive a more rewarding gift. These MIPs are best suited for inducing a positive mood state in a laboratory setting.

Hypnotic Suggestion

This form of MIP is used with participants who are susceptible to hypnosis. When hypnotised, the participants are asked to recall an affective event from their lives. Then they are asked to replay the experience in their imagination and re-experience the emotions associated with it. The intensity of the recall and procedure can be increased by asking the participant to re-experience the emotions in isolation from the event, and by asking them to increase the strength of the emotions to a level that is not overwhelming. They can also be asked to maintain the strength of the emotional event whilst they complete the experimental paradigm (see Martin, 1990). This form of MIP has limited uses because it can only be used with those participants who are susceptible to hypnosis; it tends to be employed in a clinical or therapeutic setting.

Imagination

These procedures attempt to induce mood by asking participants to imagine affectively-valenced events that were either scripted by the experimenter or have happened in the participants' daily lives (e.g., by using predefined imagery-scripts or recalling their own personal memories). Participants can also be asked to vividly imagine the event, or try to re-experience their original perceptions, sensations, and

emotional responses to the event. Getting participants to record the event, how they felt, and how they responded is considered to be a viable methodology for increasing the intensity of the procedure and target-mood (e.g., autobiographical memories and recollection MIPS; see Martin, 1990; Westermann et al., 1996). This form of MIP, like the autobiographical memories technique, is considered to be a brief and effective form of MIP that can be employed in a laboratory setting to induce different mood states.

Music

This class of MIP are also delivered with and without explicit instructions. When explicit instructions are given participants are asked to listen to the music segment(s) and experience the feelings associated with the music. When it is delivered without explicit instructions participants are just presented with the segment(s) of music, but they are naturally expected to listen to the music and experience the feelings associated with it. Experimenters tend to predetermine the affective valence of the music before it is presented to the participants with and without explicit instructions. Some music MIPS allow participants to select the music that they want to listen to, to increase the intensity of the procedure and the target-mood.

Music MIPS tend to present participants with affectively-valenced classical music segments; this type of music is considered to be better because it reduces the bias associated with lyrical forms of music (e.g., some types of music are associated with drug use and abuse; see Stein, Goldman, & Del Boca, 2000). The affectively valenced classical music segment(s) have been standardised across various studies with student, community, and clinical samples (see Clark & Teasdale, 1985; Martin,

1990; Westermann et al., 1996). This form of MIP is considered to be a convenient and effective technique that can be employed in a laboratory setting to induce different mood states.

Picture

This form of MIP uses pictures from the International Affective Picture System (IAPS). It is popular among cognitive and attention, emotion, and neuroscience researchers. Participants are usually presented with a number of affectively-valenced pictures to induce various emotions such as happiness, unhappiness, or disgust. The affectively-valenced pictures have been standardised across various studies with student, community, and clinical samples (see Lang, Bradley, & Cuthbert, 2001). This form of MIP is probably most effective when used to induce a positive or negative mood state in a laboratory setting.

Public Speaking

This form of MIP is used to induce anxiety states in a laboratory setting. Participants are informed that during the course of the experiment they will be asked to deliver a predetermined public speech to an audience. Sometimes, participants are also informed that the speech will be recorded with a video camera and other audio equipment, which is on view in the laboratory (see Martin, 1990). This form of MIP is primarily used to induce a negative rather than a positive mood state in a laboratory setting.

Social Interaction

This form of MIP exposes participants to a predetermined social interaction. Sometimes the experimenter or a confederate will be rude to the participant or they will insult them, and sometimes they will be pleasant and kind to the participant. The general assumption is that the behaviour of an actor (the experimenter or confederate) will affect the emotional state of the observer (the participant). Some studies allow the participants to assist a friend of the experimenter because they hypothesise that participants feel more elated after helping another person (see Martin, 1990; Westermann et al., 1996). This form of MIP can be used to induce a positive or negative mood state in a laboratory setting.

Social Recollection

This form of MIP is similar to the autobiographical memories and imagination MIPs, but employs two participants at the same time. Both participants are asked to recall and write down the emotions associated with four negative life events that have happened over the course of the last year. The participants are then asked to rank order the events for the amount of unhappiness they caused and discuss them between themselves for 3 minutes each. One participant plays the role of the listener and the other participant plays the role of the speaker. The listener is required to ask the speaker specific questions about the events and encourage him or her to talk about the events. The listener also enquires about the emotions associated with the events. After doing this, the listener records the salient points of the events discussed with the speaker. The participants then swap roles, so the previous speaker becomes the listener, and the previous listener becomes the speaker (see Martin, 1990; Martin,

Argyle, & Crossland, 1990). Like the autobiographical, imagination, and music MIP techniques, this form of MIP is considered to be a brief and effective methodology for inducing different mood states in a laboratory setting. However, it cannot be used in single participant testing sessions.

Solitary Recollection

This MIP was also developed by Martin et al. (1990). It differs from the social recollection MIP by employing one participant at a time instead of two. The participants are asked to record four affectively valenced events that have happened to them over the course of the last year and rank them in accord with the social recollection MIP. In the positive condition they are asked to rank order them for happiness rather than unhappiness. After doing this, the participants are asked to think about their two most salient events for 3 minutes each. They are also asked to recall how they felt, and remember what happened during the course of the events whilst they are deliberating (see Martin 1990). This form of MIP is considered to be a brief and effective methodology for inducing positive and negative mood states in a laboratory setting.

Threat

These MIPs are used to induce a state of anxiety in a laboratory setting. Some of the earliest studies threatened participants with an electric shock and informed them that the electric shock would be fairly painful, although not strong enough to burn them or cause tissue damage (Martin, 1990). Participants were also asked to remove any metallic objects from their hands and wrists for safety reasons (see

Martin, 1990). Participants were informed that they did not have to proceed with the experiment but coercion statements were used by the experimenter to encourage participants to comply and participate in the experiment. For example, participants were informed by the experimenter that the experiment was very important and that their participation was extremely valuable. This form of MIP is now considered unethical.

Velten

The Velten procedure was developed in the 1960s, and is still the most widely used MIP today. This procedure employs self-referent statements and asks participants to try and feel the moods associated with the positive or negative statements. This procedure also uses neutral non-self referent statements to minimise the effects of pre-existing mood differences among the participants not assigned to the positive or negative mood-induction conditions. This procedure has been heavily criticised because it has high compliance and demand characteristics. For example, the original set of self-referent statements was reduced from 60 to 25 when the procedure was modified (see Martin, 1990; Westermann et al., 1996).

Combined MIPs

The majority of researchers advocate a combination of techniques to increase the effectiveness of MIPs (see Hernandez, Vander Wal, & Spring, 2003; Richell & Anderson, 2004, Westermann, et al., 1996). The most recent examples include complex combined MIPs such as Virtual Reality (VR) and those delivered over the internet.

Virtual Reality (VR)

VR MIPs employ a virtual environment such as a park to induce the target-mood state in. The virtual environment starts with a story with a predetermined affective-valence that is read by a woman. The participant is asked to listen to the woman's voice, which gives them an introduction to the virtual environment and the target-mood state. Once the participant has entered the virtual environment, he or she starts to walk by the park. The virtual environmental conditions are changed in accord with the target-mood state. For example, in the negative condition the park is grey and overcast, the trees have no leaves on them, there are no other people in the park, and the music that is heard is emotionally saddening (see Banos, Botella, Garcia-Palacios, Perpina, & Alcaniz, 2000).

After two minutes of walking by the virtual park the participant is asked to go to the bandstand and find a statement located on one of the walls. The statement is one of five statements selected from the Velten MIP, in accord with the target-mood state. Next, the participant is asked to consider the personal meaning of the statement. At the same time, a segment of music that is congruent with the meaning of the statement is heard by the participant, and four pictorial images are presented above the statement. The participant has to select one of the four images (Banos et al., 2000). The images are similar to those employed in the International Affective Picture System (IAPS).

When the participant has finished the Velten and pictorial procedures, he or she is asked to walk around the park for another two minutes. Then the participant is invited to go to a virtual summer cinema to see a film consisting of short scenes. The film is chosen in accord with the target-mood state. Lastly, after completing the film visualisation task, the participant is asked to think about a similar personal event, and

explain what happened during the course of the event it in a loud voice (autobiographical memories technique). At the end of the VR MIP, the VR system thanks the participant for his or her experience. During the debriefing for the negative condition the participant is asked to walk around the park again, which now has a positive virtual environmental content to facilitate the removal of any residual negative emotions before the participant is returned to reality (Banos et al., 2000).

This procedure is obviously promising, because it combines several methods known to be effective. However, it relies on the use of complex VR technology and programming, which are not widely available. Also, it remains to be established whether VR-induced moods transfer to real-life experimental situations (e.g., if participants are subsequently asked to complete other tasks).

World-Wide-Web (WWW) or Internet

There is limited research regarding the delivery of MIPs over the WWW or Internet. Goritz and Moser (2006) established that a Velten and mood-suggestive photo MIPs were effective for inducing a negative mood over the internet. They go on to claim that a number of MIPs can be delivered over the internet with only a few minor adjustments (e.g., autobiographical memories, Velten, feedback, affective-pictures, jokes, and affectively-valenced words or texts). IAPS or affective-pictures can be delivered without explicit instructions to get the participant into the target-mood. In a later study, Goritz (2007) found that picture-illustrated emotive texts delivered over the internet were able to induce a positive and negative mood state in participants. There may be some problems with systematic non-compliance when MIPs are delivered over the internet. For example, participants in the negative condition may disengage from the procedure early or drop-out of it completely. Goritz

(2007) claimed that systematic non-compliance is more likely to occur in neutral conditions than negative ones (see Goritz, 2007 for a review of internet MIPs and systematic non-compliance). These MIPs are not a method of choice in conventional experimental testing situations, where their components can be administered more straightforwardly.

Conclusions on MIPs

The present review shows that there are a large number of MIPs that can be used to cause transient changes in mood-state in student, community, and clinical samples. They are generally considered to be as effective as each other (see Martin, 1990; Westermann, 1996), although differing in scope and ease of administration (as highlighted above). Mood-inductions can be delivered through singular, combined, or advanced procedures, but the majority of them can be said to have some form of demand and compliance characteristics. Some of the most efficacious MIPs with the least demand and compliance characteristics are the autobiographical memories, imagination, social recollection, and music techniques. Therefore, the present researcher decided to employ a combined approach that combines two of these techniques, namely the autobiographical memories technique (Brewer, Doughtie, & Lubin, 1980; Park, Goodyer, & Teasdale, 2004) coupled with mood-congruent music without instructions (Birch, Stewart, Wall, McKee, Eisnor, & Theakston, 2004), in the final study of this thesis. This approach is both in line with the previous addiction literature, where various MIPs have been used, and novel, because this combination of MIPs had not so far been employed in a study that used Gray's personality concepts. The next section of this chapter reviews the findings from MIP studies in addictive behaviours research.

MIPs in Addictive Behaviours Research

Experimental studies in addictive behaviours literature have established the effects of induced mood on alcohol expectancies, cravings, urges, alcohol use motives, tobacco craving, marijuana craving, pathological disorders, and risk factors for alcohol misuse (e.g., Birch et al., 2004; Conklin, Tiffany, & Vrana, 2000; Cooney, Litt, Morse, Bauer, & Gaupp, 1997; Cox, Blount, & Rozak, 1998; Feldtkeller, Weinstein, Cox, & Nutt, 2001; Franken, 2002; Hufford, 2001; Goldstein, Wall, McKee, & Hinson, 2004; Nesic & Duka, 2008; Randall & Cox, 2001; Rubonis, Colby, Monti, Rohsenow, Gulliver, & Sirota, 1994; Singleton, Anderson, & Heishman, 2003; Singleton, Trotman, Zavahir, Taylor, & Heishman, 2002; Stein, Goldman, & Del Boca, 2000; Weinstein, Lingford-Hughes, Martinez-Raga, & Marshall, 1998; Zisserson & Palfai, 2007).

In a series of studies, Stewart and colleagues used music MIPs to help establish the relationships between induced mood and alcohol cognitions (e.g., alcohol reinforcement expectancies). The participants for this series of studies were selected, recruited, and assigned to the enhancement or coping alcohol use motives groups from larger samples, which had previously completed the Drinking Motives Questionnaire-Revised (DMQ-R). In one study, they found that, in the negative mood condition, the coping group showed an increase in emotional relief expectancies from drinking alcohol. Conversely, in the positive mood condition, the enhancement group showed an increase in emotional reward expectancies from drinking alcohol (Birch et al., 2004). However, in a later study which employed the same procedures, both groups showed an increase in emotional relief expectancies from drinking after being exposed to a negative music MIP (Grant & Stewart, 2007). This pattern of results is not surprising, because for enhancement (or reward drinkers) who are in a negative

mood state emotional relief expectancies can also be a source of positive reinforcement that is associated with the alleviation of negative emotional states.

In another music MIP study, Stewart and colleagues found that, in the negative mood condition, the coping group showed an increase in Alcohol-Stroop colour-naming latencies for target-words. In the positive mood condition, the enhancement group showed the same pattern of results. The authors concluded that both coping and enhancement motivated drinkers, when in the target-mood, have an attentional bias for alcohol-related stimuli (Grant, Stewart, & Birch, 2007).³ In a similar study that employed the same procedures, the Alcohol-Stroop, and Extrinsic Affective Simon Task (EAST), a similar pattern of results was found for the enhancement but not for the coping group. In the positive mood condition, the enhancement group was again found to show an increase in attentional bias for alcohol related stimuli and an increase in EAST reward-explicit associations (Birch, Stewart, Wiers, Klein, MacLean, & Berish, 2008). The Alcohol-Stroop, EAST, and other response-time based expectancy tasks are considered to be superior experimental paradigms for establishing alcohol cognitions because they elicit implicit alcohol cognitions, and thus reduce the bias associated with self-report questionnaires which elicit explicit alcohol cognitions (see Read & Curtin, 2007; Weirs, Cox, Field, Fadardi, Palfai, Schoenmakers, & Stacy, 2006).

Across studies, Stewart and colleagues used music MIPs to induce transient changes in negative or positive mood-state and found no problems with either the

³ Alcohol attentional bias is the term given to the attentional interference that is caused by alcohol-related stimuli that engage the focus of attention (see Cox, et al., 2002; Fadardi & Cox, 2006; Field & Eastwood, 2005).

implementation of this type of MIP or its reliability. This confirms that a music MIP is a credible procedure that can be administered in addiction research to produce meaningful results.

A combined pictorial and music MIP study (Hufford, 2001) found that participants in the negative mood condition endorsed more positive alcohol expectancies on the Alcohol Expectancy Questionnaire (AEQ) than those in the positive mood condition. Hufford also reported that participants in the negative mood condition scored higher on the global positive changes and tension-reduction scales of the AEQ than those in the positive mood condition. He went on to claim that negative affect can bias participants' positive expectancies for consuming alcohol because it influences memory structures. By doing this negative affect plays an important role in the decision to drink. Hufford concluded that his findings are in agreement with Cox and Klinger's model, which states that people drink for affective gain (e.g., to reduce negative emotionality).

Mood-Inductions and Taste-Tests

Taste-tests are considered to be an unobtrusive measure of alcohol consumption that allow researchers to establish the determinants of alcohol use, because they are relatively free from the demand characteristics that might otherwise affect drinking behaviour in a laboratory setting (Caudill & Marlatt, 1975, p. 407). Taste-tests have been shown to be a valid experimental technique for investigating the determinants of drinking behaviour in diverse populations. For example, Caudill and Marlatt (1975) found that when participants were exposed to a heavy drinking confederate, they consumed more alcohol during the wine tasting test than participants exposed to a low-consumption confederate (a Social Interaction MIP). A

Social Interaction MIP was again used by Marlatt and colleagues to induce negative and neutral mood states in social drinkers. They found that participants in the negative mood condition who were made angry by a confederate and who were allowed to retaliate, drank less alcohol than those who were not allowed to retaliate. In other words, participants who were allowed to externalise their anger drank less alcohol than those participants who had to internalise their anger. The control group drank an intermediate amount of alcohol which did not differ from the amount consumed by the other two groups (Marlatt, Kosturn, & Lang, 1975, p. 652). In another study that employed a Threat MIP, Higgins and Marlatt (1973) found that alcohol dependent participants consumed more alcohol than the social drinking participants. However, the Threat MIP failed to produce any significant changes in the amount of alcohol consumed or anxiety scores.

Taste-tests have also been used to establish the associations between drinking behaviour and motivational or attentional aspects of alcohol use in student and non-student populations (e.g., Birch et al., 2004; Connors, Maisto, & Sobell, 1978; Field & Eastwood, 2005; Kambouropoulos & Staiger, 2004; Marlatt, Demming, & Reid, 1973; Palfai, 2006; Randall & Cox, 2001; Stein, Goldman, Del Boca, 2000; Van Tilburg & Vingerhoets, 2002; Wilkie & Stewart, 2005; Willner, Field, Pitts, & Reeve, 1998; Zack, Poulos, Fragopoulos, Woodford, & MacLeod, 2006). For example, Wilkie and Stewart (2005, p. 835) reported finding positive and negative reinforcing mood effects for alcohol administered to coping and enhancement motivated student drinkers, but they failed to show a clear differentiation between these groups on reinforcement specificity. These authors claimed that the enhancement motivated drinkers placed a greater value on the stimulating (positive reinforcement) aspects of

alcohol consumption, whereas the coping motivated drinkers placed a greater value on the stress-reduction (negative reinforcement) aspects of alcohol consumption.

These studies support Marlatt's claims that taste-tests are an unobtrusive, reliable, and valid procedure for establishing the determinants of alcohol use among diverse samples, even when they do not employ MIPs, or employ non-alcohol based beverages. For example, Brown and Williams (1975) reported that alcohol dependent participants drank more tea (the most preferred beverage) and less water (the non-preferred beverage) than non-alcohol dependent participants during a taste-test (see also Connors, Maisto, & Sobell, 1978; Pliner & Steverango, 1994). Therefore, a taste-test was employed in the final study of the present thesis to explore the determinants of alcohol use among a sample of student drinkers. More specifically, a taste-test was used to investigate the reinforcing aspects of alcohol in an experimental setting, where participants' mood-states were manipulated.

Summary and Conclusions

This chapter addresses the learning, reinforcement, and neuropharmacological principles of alcohol reinforcement within RST at a psychological, behavioural, and neuropharmacological level. Thus, participants with a sensitivity to reward predisposition were shown to favour both the positive and negative reinforcing aspects of alcohol, but have a greater preference for the positive or rewarding aspects of alcohol use. Conversely, participants with sensitivity to punishment predisposition were shown to favour the negative reinforcement aspects of alcohol. The term *negative reinforcement* is used to encompass drinking to cope, the alleviation of negative emotionality through drinking, and the reduction of withdrawal symptoms through drinking, a perspective that is broader than the usual conceptualisations of

negative reinforcement. It was made clear that researchers should take assessments of the incentive value of alcohol when investigating the reinforcement properties of alcohol. In the arousal-decision and comparator section of the review it was made clear that participants should be allowed to make subjective evaluations of the rewarding or punishing properties of stimuli that are independent of the value attached to the stimuli by the researcher. For example, the researcher might deem the stimuli as rewarding or appetitive, but the participants might find the stimuli to be punishing or aversive, and vice versa. This approach was adopted in the design of the final study in this thesis.

The learning, reinforcement, and neuropharmacological principles of alcohol use are central to Cox and Klinger's motivational model of alcohol use (reviewed in Chapters 2 and 4). Within this model, these concepts are addressed in the past reinforcement, learned cognitive and conditioned reactions to alcohol, direct and indirect instrumental effects of alcohol, and net benefits from drinking component levels. Hence, Cox and Klinger's model can be said to integrate the learning and reinforcement principles of alcohol use into a broader motivational perspective of substance use, which also includes affective regulation and non-alcohol related incentives, such as life-goals (see Cox & Klinger, 2004, p. 41).

The findings reviewed in the present chapter show that some personality types are more susceptible to certain mood-induction procedures than others. For example, participants with a sensitivity to reward predisposition are more susceptible to a positive mood-induction than participants with a sensitivity to punishment predisposition, who are more susceptible to a negative mood-induction.

This review also shows that a multitude of single-method, combined, and complex mood-induction procedures can be used to cause a transient change in mood

in a laboratory setting. However, many of these procedures are not suitable for inducing more than one mood state in a laboratory setting; these include hypnosis, threat, and gift MIPs. A number of brief, effective, and easy-to-deliver MIPs that can be used to induce more than one mood state in a laboratory setting have been identified; these include imagination and social recollection MIPs. It is suggested that combined MIPs, such as autobiographical memories and music, are better than single-method MIPs, because they can be employed to increase the effectiveness of the procedure and the strength of the target-mood.

In general, this chapter shows that MIPs are a valid and reliable experimental technique than can be used to explore the determinants of substance use, such as alcohol-related cognitions, alcohol cravings, and alcohol expectancies. They can also be used to establish the determinants of tobacco and marijuana craving. MIPs can be delivered through various mediums, such as self-report, audio, visual, virtual reality, and internet, which emphasises the flexibility and utility of MIPs as an experimental technique for investigating the determinants of behaviour.

This review also highlights the importance of MIPs and taste-tests within addictive behaviours research. These procedures and experimental methodologies are discrete, brief, valid, and reliable experimental methodologies for assessing behavioural responses to alcohol-related stimuli among diverse samples. Taste-tests can employ alcohol-based beverages, non-alcohol based beverages, and placebo beverages, where a few drops of alcohol are added to a non-alcohol based beverage. More specifically, they can be used to establish the interactions between personality, emotion, and alcohol reinforcement motivations by allowing direct measurements of alcohol consumption, rather than relying on indirect self-report measurements (e.g., drinking diary).

Study 3, presented in Chapter 7, was designed to establish the relationships between personality, alcohol reinforcement motivation, affective regulation, and drinking behaviours among students. This was accomplished with a combined mood-induction procedure and an alcohol-taste test. The former procedure was used to establish how emotion affects behaviour, the latter to provide an objective measure of alcohol consumption (a self-report drinking diary was also included among the study measures). Theoretically derived predictions regarding the relationships between the study variables are listed in Chapter 7, following a brief introduction linking this study to Studies 1 and 2.