An Application of RST in Understanding Social Anxiety and Alcohol Use

by

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<th>Definition</th>
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<tbody>
<tr>
<td>Social Anxiety Disorder</td>
<td></td>
</tr>
<tr>
<td>SAD</td>
<td>Social Anxiety Disorder</td>
</tr>
<tr>
<td>G-SAD</td>
<td>Generalised Social Anxiety Disorder</td>
</tr>
<tr>
<td>S-SAD</td>
<td>Specific Social Anxiety Disorder</td>
</tr>
<tr>
<td>Substance Use Disorders</td>
<td></td>
</tr>
<tr>
<td>AUDs</td>
<td>Alcohol Use Disorders</td>
</tr>
<tr>
<td>RST Constructs</td>
<td></td>
</tr>
<tr>
<td>o-RST</td>
<td>Original Reinforcement Sensitivity Theory</td>
</tr>
<tr>
<td>r-RST</td>
<td>Revised Reinforcement Sensitivity Theory</td>
</tr>
<tr>
<td>o-RST</td>
<td>Original Reinforcement Sensitivity Theory</td>
</tr>
<tr>
<td>o-BIS</td>
<td>Original Behavioural Inhibition System</td>
</tr>
<tr>
<td>r-BIS</td>
<td>Revised Behavioural Inhibition System</td>
</tr>
<tr>
<td>o-BAS</td>
<td>Original Behavioural Activation System</td>
</tr>
<tr>
<td>r-BAS</td>
<td>Revised Behavioural Activation System</td>
</tr>
<tr>
<td>FFS</td>
<td>Flight-Freeze System</td>
</tr>
<tr>
<td>FFFS</td>
<td>Fight-Flight-Freeze System</td>
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</table>
Abstract

The purpose of this thesis is to provide a comprehensive analysis of motivational processes in individuals with social anxiety and co-morbid alcohol use. There is a dearth of literature in this area despite the clear applicability of motivational processes in both clinical and community populations. Drawing on data derived from clinical studies, this thesis will specifically focus upon subclinical levels of social anxiety and problematic alcohol use as measured in two large Australian community populations. Current aetiological models explaining elevated SAD and AUDs (e.g., the Self Medication Hypothesis) focus mainly on aversive motivation, thus neglect a substantial body of evidence which has demonstrated the importance of appetitive processes in understanding alcohol use. Reinforcement Sensitivity Theory (RST) can address this and other issues apparent within current aetiological models, offering a framework which encapsulates individual differences in both aversive and appetitive motivation.

Study one of the current thesis investigated the role of revised RST (r-RST) in understanding social anxiety and alcohol use in a large community population (N=547). Results derived from the self report questionnaire data indicated that r-RST is implicated in understanding social anxiety and co-morbid problematic alcohol use. Group analyses found those with high co-morbidity reported high levels of FFFS (Fight-Flight-Freeze System; threat detection/fear), fear, trait anxiety, and r-BAS (revised Behavioural Approach System; reward sensitivity). There was no significant difference between groups for r-BIS (revised Behavioural Inhibition System; conflict resolution/anxiety). R-BAS was found to be significantly higher in participants with co-morbidity when compared to
individuals with elevated social anxiety only. In study two, the relationships between r-RST variables, fear, anxiety, defensive behaviour and threat perception variables were explored. Defensive behaviour and threat perception were measured using threat scenarios modelled on rodent defensive behaviours. Correlations and group differences were largely in line with predictions and support the contention that there are parallels between rodent and human behaviour. Further, results offer support for the proposed contention that individual differences in reinforcement sensitivities is associated with differential defensive behaviours and perceptions of threat in response to threatening stimuli. Data also indicated a meditational influence of threat perception on the relationships between r-RST, fear, anxiety and social anxiety. A particularly strong finding indicated that the perceived level of escapability from threat significantly mediated the relationship between FFFS and social anxiety. Finally, group differences in threat perception were found between individuals with high levels of social anxiety and hazardous alcohol use when compared to controls.

It was concluded that by employing r-RST this thesis was the first study to provide important information beyond that afforded by current motivational models in both the social anxiety and alcohol use literature. Specifically, it seems FFFS is the most important variable in understanding social anxiety and o-BAS in understanding co-morbid hazardous alcohol use. There was mixed findings regarding r-BAS and co-morbid alcohol use in socially anxious participants. Threat perception offers some explanation for understanding relationships between r-RST constructs and social anxiety. It was concluded that results may be employed to better understand subclinical levels of social anxiety and alcohol use to facilitate early intervention strategies.
Synopsis

A profusion of studies have demonstrated a positive relationship between social anxiety and problematic alcohol use (Chartier, Walker, & Stein, 2003; Hasin, Stinson, Ogburn, & Grant, 2007; Kessler, Berglund, Demler, Jin, & Walters, 2005; Lampe, Slade, Issakidis, & Andrews, 2003; Schneier, et al., 2010), and longitudinal studies indicate that social anxiety typically precedes the development of alcohol use disorders (AUDs) in those with co-morbidity (Lampe, et al., 2003). A number of hypotheses have been derived to explain the co-morbidity between anxiety disorders and alcohol use disorders (e.g., the 'Tension-reduction theory', Conger, 1951; the 'Self Medication Hypothesis'; Carrigan & Randall, 2003). A commonality among these theories is the argument that this relationship can be explained by aversive motivation, that is, that alcohol use is developed and perpetuated due to the anxiolytic effects of the drug via negative reinforcement processes. These theories propose that individuals with elevated anxiety use alcohol to cope with unwanted anxiety symptoms (Carrigan & Randall, 2003; Kushner, Abrams, & Borchardt, 2000), such as that experienced in social situations for individuals with SAD (Blumenthal, Leen-Feldner, Frala, Badour, & Ham, 2010; Buckner & Heimberg, 2010). Despite this prevailing belief, there has been mixed support in the alcohol use literature for these hypotheses (Amit & Brown, 1982; Cappell & Greeley, 1987; Kushner, Sher, & Beitman, 1990) and these theories do not explain why some individuals drink alcohol to excess whereas others do not (Wise & Bozarth, 1987). Nor can these models account for the strong support for the role of positive reinforcement (appetitive motivation) in approaching alcohol (Stewart, de Wit, & Eikelboom, 1984; Wise, 1998; Wise & Bozarth, 1987) and the extensive literature base which
implicates appetitive motivational processes in understanding alcohol use (e.g., Franken, 2002; Kambouropoulos & Staiger, 2001; 2004; 2009; Kimbrel, Mitchell, & Nelson-Gray, 2010).

Reinforcement Sensitivity Theory (RST; Gray & McNaughton, 2000), a model of individual variation in sensitivity to reinforcing stimuli (i.e., threats and rewards), delineates positive and negative reinforcement processes and can be utilised to address the shortcomings of the aforementioned models. Originally derived by Gray (Gray, 1970; 1982), RST has undergone substantial revision (r-RST; Gray & McNaughton, 2000) and now comprises three biologically based systems; the Fight-Flight-Freeze System (FFFS; responsible for fear), the Behavioural Inhibition System (r-BIS; anxiety), and Behavioural Activation System (r-BAS; reward sensitivity). The revised model has striking relevance for understanding motivational processes in the development and maintenance of social anxiety and co-morbid alcohol use. In particular, the revised RST delineates fear and anxiety, two emotions characteristic of SAD (APA, 2000) which promote avoidance and inhibited behaviour (Russell, et al., 2011; Schneier, Rodebaugh, Blanco, Lewin, & Liebowitz, 2011). Moreover, utilising the original conceptualisation of RST reward sensitivity (o-BAS) has consistently been found to be associated with drinking behaviour (e.g., Hundt, Kimbrel, Mitchell, & Nelson-Gray, 2008; Kambouropoulos & Staiger, 2001; 2007; Loxton & Dawe, 2001). Despite the clear applicability of this model to these highly co-morbid disorders, no studies have utilised r-RST as a framework for investigating the co-morbidity between social anxiety and alcohol use.

In a recent review, Kimbrel (2008) proposed a theoretical account of the role of r-RST in understanding SAD, whereby co-morbidity was explained by
heightened r-BIS and FFFS. Whilst a consistent relationship between social anxiety and the original conceptualisation of BIS (o-BIS) has been repeatedly demonstrated in empirical studies (Coplan, Wilson, Frohlick, & Zelenski, 2006; Kashdan & Roberts, 2006; Kimbrel, Cobb, Mitchell, Hundt, & Nelson-Gray, 2008), o-BIS has been shown to have very little, if any, involvement in the understanding of alcohol use (e.g., Franken, Muris, & Georgieva, 2006; Pardo, Aguilar, Molinuevo, & Torrubia, 2007). In contrast, there is an abundance of research which has found the o-BAS to be the best predictor of hazardous alcohol use (Franken, 2002; Franken & Muris, 2006; Hundt, et al., 2008; Johnson, Turner, & Iwata, 2003; Kambouropoulos & Staiger, 2001; 2004; Loxton & Dawe, 2001; O’Conner & Colder, 2005; Pardo, et al., 2007; Zisserson & Palfai, 2007). Clearly, more research is needed to better understand how these processes affect alcohol use in socially anxious individuals.

Only a small number of empirical studies have specifically examined the role of motivational processes in social anxiety (Coplan, et al., 2006; Kashdan & Roberts, 2006; Kimbrel, et al., 2008) and only one has considered co-morbid alcohol use (Booth & Hasking, 2009). This is surprising given there is a plethora of literature regarding other aetiological and maintaining factors for heightened social anxiety (e.g., Elizabeth, et al., 2006; Nelson, 2000; Schwartz, 1999; Wittchen, Stein, & Kessler, 1999) and problematic alcohol use (e.g., Barnes & Welte, 1986; Cloninger, Bohman, Sigvardsson, & Knorring, 1985; Kendler, Schmitt, Aggen, & Prescott, 2008). This has led to a body of literature with substantial limitations in understanding the processes that may facilitate the development of co-morbidity. Thus, the following review will argue that an examination of aversive and appetitive motivational processes as delineated by r-
RST may offer an avenue to better understand the co-morbidity between social anxiety in and alcohol use in a community population.

Chapter one of the following thesis will discuss characteristics of SAD including diagnosis, prevalence, onset and course, SAD-AUD co-morbidity, as well as aetiological factors pertinent to understanding the motivational processes associated with these disorders. In chapter two, RST is proposed as an appropriate framework through which these conditions as well as their subclinical counterparts can be understood. The original and revised conceptualisations of RST will be discussed, in addition to an analysis of the literature regarding their importance in understanding social anxiety and alcohol use. In chapter three the limitations within the current alcohol and social anxiety literature will be systematically addressed with reference to the current proposed studies. Specifically, it is argued that heightened FFFS and r-BIS sensitivities will be characteristic of individuals with social anxiety, whereas elevated r-BAS will be associated with alcohol use in the community.

Thus, the primary aims of this thesis are:

1. To investigate motivational processes involved in understanding social anxiety and alcohol use by utilising r-RST;

2. To obtain a greater understanding of defensive behaviour and threat perception in understanding the relationship between r-RST, social anxiety, and alcohol use.

To this end, two studies are reported that investigate these aims. Using self report methodology, study one was designed to investigate the revised RST in
understanding elevated levels of social anxiety and hazardous alcohol use in a community sample. Further, this study aimed to investigate the role of trait fearfulness and anxiety to determine the independence of these emotions, in line with revisions to RST, in understanding social anxiety. Despite the applicability of r-RST in understanding social anxiety and co-morbid hazardous alcohol use, no studies to date have drawn on r-RST to explore this relationship.

Study two aimed to expand upon findings from study one by investigating defensive behaviour and threat perception in understanding social anxiety and alcohol use in a community sample. Using threatening scenarios, this study provided an avenue to examine motivational processes involved in understanding social anxiety and alcohol use as well as the involvement of ecological variables such as threat perception (e.g., ambiguity, availability for concealment) in understanding appetitive and aversive orientation.

Finally, the general discussion will firstly summarise results derived from both of these studies and highlight the contribution they have made to the literature. This is followed by an integrated discussion of the results including implications of findings and avenues for future research.
Chapter One: Understanding Social Anxiety and Co-morbid Alcohol Use

Overview

It is thought that social anxiety can be conceptualised as a continuum, whereby Social Anxiety Disorder (SAD) is considered to be located towards the upper end of the social anxiety scale (Boone, et al., 1999; Hofmann, Newman, Ehlers, & Roth, 1995; Rapee & Heimberg, 1997; Rapee & Spence, 2004; Tillfors, Furmark, Ekselius, & Fredrikson, 2004). For individuals with SAD, socially provoked fear and anxiety inhibits occupational functioning, relationships, and quality of life (APA, 2000). However, one need not meet all diagnostic criteria for SAD to experience elevated and distressing levels of social anxiety (Rapee & Heimberg, 1997; Rapee & Spence, 2004). Social anxiety is a phenomenon experienced by most individuals at some point in their lives (Stein, Murray, Torgrud, & Walker, 2000); however it is often misunderstood for a shy temperament and thus remains under recognised and often untreated (Keller, 2003).

SAD has been consistently associated with an increased rate of AUDs (Chartier, et al., 2003; Lampe, et al., 2003). While SAD is frequently found to be co-morbid with many axis one conditions (Chartier, et al., 2003; Ohayon & Schatzberg, 2010; Wittchen, Fuetsch, Müller, & Liebowitz, 2000), the relationship between SAD and the AUDs is considered to be unique as SAD is thought to often precipitate the development of co-morbid AUDs (Crum & Pratt, 2001; Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992). Specifically, studies have shown that the age of onset for SAD is typically younger than that for AUDs while others have demonstrated that SAD precedes the development of
AUDs through longitudinal research (Crum & Pratt, 2001; Schneier, et al., 1992). This is particularly evident in individuals with subclinical levels of social anxiety, suggesting that individuals who are not avoiding social situations at a younger age are at a greater risk of developing subsequent alcohol use disorders (Crum & Pratt, 2001). The diagnoses, onset, aetiology, and co-morbidity of SAD and the AUDs will be discussed in greater detail in the following sections.

**Diagnosis of SAD**

Otherwise known as ‘Social Phobia’ SAD is described by the American Psychiatric Association’s Diagnostic and Statistical Manual (DSM-IV-TR) as ‘a marked and persistent fear of one or more social or performance situations in which the person is exposed to unfamiliar people or to possible scrutiny by others. The avoidance, anxious anticipation, or distress in the feared social or performance situation(s), interferes significantly with the person’s normal routine, occupational (academic) functioning, or social activities or relationships, or there is marked distress about having the phobia’ (APA, 2000, p. 450). In the DSM-III-R (APA, 1987), a generalised specifier was introduced which applies to individuals fearful of most social environments; not just situations involving performance such as is found in the non-generalised/specific subtype. Classification criteria of SAD published in the DSM-III-R and subsequent editions are fundamentally the same as they stand today in the DSM-IV-TR (APA, 1987; 1994; 2000).

The introduction of the generalised specifier was in response to differences noted in the situations feared by individuals with social anxiety. It was noted the social stimuli typically associated with social anxiety (e.g., eating,
drinking, writing in the presence of others, general social interaction, and public speaking; Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992) could be separated into two categories; those which include interacting in various social situations (e.g., dating anxiety, communication with the opposite sex, anxiety in interpersonal situations), and those which involve being observed or scrutinised while performing a task (e.g., eating, drinking, giving a speech) (Liebowitz, 1987; Mattick & Clarke, 1998). These form distinct areas of social anxiety which are unique in their presentation and have been reflected by diagnostic changes in the upcoming revised diagnostic manual for mental disorders (APA, 2011). Leary (1983) has also described differences in social interaction and performance anxiety, specifying that social interaction is contingent on the responses and reactions from others in the situation, whereas non-contingent encounters (e.g., giving a speech or performance) are largely one way and do not require the adaptation of behaviour to the responses to the listener or observer. Whilst there appears to be consensus regarding the distinction of two separate aspects of social anxiety (APA, 2000; Leary, 1983; Liebowitz, 1987; Mattick & Clarke, 1998) and it is noted that social interaction and performance anxiety can occur independent of one another (Mattick & Clarke, 1998), they are also frequently co-occurring and have been found to load onto one higher order factor, social anxiety (Safren, Turk, & Heimberg, 1998).

In the upcoming DSM-V which is currently being finalised, the term Social Phobia has been replaced with the more commonly used Social Anxiety Disorder (APA, 2011) and as such this term will be utilised throughout the present thesis. Another change pertinent to the present thesis is that the generalised subcategory has been retained whereas the specific subcategory has
been replaced with a “performance only” category which applies if the individual experiences social anxiety solely when being judged or scrutinised when performing tasks.

Clinical Versus Sub-Threshold Social Anxiety

An abundance of literature has described social anxiety as a continuum (Boone, et al., 1999; Hofmann, et al., 1995; Rapee & Heimberg, 1997; Rapee & Spence, 2004; Tillfors, et al., 2004). An absence of social anxiety is conceptualised as the lowest end, followed by levels of social anxiety which does not impair functioning in activities or cause significant distress. Next on the continuum is moderate social anxiety which occurs only in a small number of situations and causes only mild distress. SAD is thought to lie towards to upper end of the continuum, representing significant distress fear and anxiety which is typically seen in G-SAD (Rapee & Spence, 2004). Finally, at the extreme end of the continuum is Avoidant Personality Disorder which is typified by significant social avoidance and isolation (APA, 2000).

Considering social anxiety as a continuum suggests that one does not need to meet all criteria for SAD to experience elevated levels of social anxiety that can negatively impact functioning (Wittchen, et al., 2000). Whilst these individuals may not meet the criteria for SAD, they are reporting elevated levels of fear and distress in social situations which is characteristic of this disorder (Pelissolo, Andre, Moutard-Martin, Wittchen, & Lepine, 2000). This highlights the need for a better understanding of social anxiety within the general population.
Prevalence, Course, and Age of Onset

Of the anxiety disorders, SAD is the most prevalent (Westenberg, 1998). It is estimated to affect approximately 13-14% of people at some point in their life (Wittchen, 2001), although there is great variability among prevalence findings (Kessler, et al., 2005; Lampe, et al., 2003; Pelissolo, et al., 2000; Wittchen, 2001). In an American sample, Keller et al. (2003) found SAD to be the fourth most prevalent disorder, preceded only by depression (16.6%), alcohol abuse (13.2%), and specific phobia (12.5%); 12.1% of the sample reported a diagnosis of SAD. With regard to subtype, the generalised form is considered more prevalent and severe than the non-generalised type (Kessler, Stein, & Berglund, 1998).

Studies have found the mean age of onset of SAD ranges from 13 – 18 years (Falk, Hasiao-ye, & Hilton, 2008; Keller, 2003; Kessler, et al., 2005; Lampe, et al., 2003). Females are slightly more likely to be diagnosed with SAD than males (Kessler, et al., 2005; Lampe, et al., 2003; Pelissolo, et al., 2000; Yonkers, Dyck, & Keller, 2001) and tend to experience greater impairment than men (Yonkers, et al., 2001). SAD is highly chronic over the lifespan (Keller, 2003), with an average duration of approximately 23 years (Wittchen, et al., 2000).

Co-morbidity

A number of psychological disorders have been found to be highly co-morbid with SAD (Chartier, et al., 2003; Schneier, et al., 2010). Specifically, individuals with a diagnosis of SAD are more likely to have a diagnosis of dysthymia, agoraphobia, major depression, panic disorder, obsessive compulsive disorder, drug abuse and dependence, and alcohol dependence (Ohayon &

This review will focus on the co-morbidity of SAD and AUDs (see Appendix B for Substance Use Dependence criteria and Appendix C for Substance Abuse Disorder criteria). This is due to the unique relationship which exists between these disorders, as both specific and generalised SAD have been found to precede the onset of AUDs (Buckner, et al., 2008; Falk, et al., 2008). There has been an increasing body of literature demonstrating strong co-occurrence of SAD and AUDs, in epidemiological studies investigating this relationship in the general population (e.g., Chartier, et al., 2003; Lampe, et al., 2003) as well as in clinical samples (Thomas, Thevos, & Randall, 1999). The likelihood of having either disorder increases twofold if one has the other disorder (Kushner, Krueger, Frye, & Peterson, 2008).

Specifically, research has typically found a relationship between alcohol dependence and SAD, however the role of alcohol abuse is less clear (e.g., Buckner, et al., 2008; Chartier, et al., 2003). This is not surprising as alcohol dependence and abuse are two distinct constructs. Alcohol dependence is characterised by symptoms of tolerance and withdrawal, and persistence with use despite unwanted symptoms. In contrast, alcohol abuse is characterised by repeated use leading to detrimental consequences (APA, 2000, p. 192).

The relationship between SAD and alcohol dependence and abuse was demonstrated in a large Canadian epidemiological study involving 8,116 participants (Chartier, et al., 2003). Respondents with SAD (DSM-III-R; APA, 1987) were significantly more likely to be diagnosed with alcohol abuse and or
dependence (16.3%) than those without a diagnosis of SAD (9.6%); no significant differences were observed between the groups for alcohol abuse. Similarly, an Australian epidemiological study (Lampe, et al., 2003) found 16.7% of the 10,641 individuals measured who met the criteria for SAD (DMS-IV; APA, 1994) also had a co-morbid alcohol abuse or dependence disorder.

In a longitudinal study, participants were assessed at age 16, 24, and again at 30 years of age (Buckner, et al., 2008). Results indicated that a diagnosis of SAD (DSM-IV; APA, 1994) at age 16 was significantly associated with alcohol dependence, but not abuse, when assessed again at 30 years of age. At age 24, 26% of those with a SAD diagnosis at 16 years had developed alcohol dependence (typically between 18-19 years of age), compared with only 8.5% of those without a SAD diagnosis at age 16.

As can be seen, individuals with SAD are more likely to be dependent upon alcohol than individuals without SAD (Buckner, et al., 2008; Chartier, et al., 2003; Lampe, et al., 2003), and SAD is predictive of the later development of alcohol dependence (Buckner, et al., 2008). This is particularly concerning given that heavy and regular alcohol consumption is associated with a number of negative health outcomes including increased risk of stroke, heart disease, brain and liver damage, high blood pressure and some cancers (de Looper & Bhatia, 2001).

Aetiology of SAD, AUDs, and Co-morbidity

Whilst there is a plethora of research regarding the aetiology of social anxiety and alcohol use (e.g., Beidel & Turner, 2007; Nelson, 2000; Wittchen, et al., 1999), the focus of this thesis is on the role of motivational processes in
understanding these behaviours. While there is a multitude of research regarding broader aetiological factors (e.g., genetics, temperament, and parental interactions) relatively few studies have specifically investigated the role of motivational processes. It is further argued that this dearth of research has resulted in an incomplete understanding of the potential mechanisms that might facilitate the development of co-morbid social anxiety and alcohol use. Thus, the following review will specifically discuss the aetiological factors specific to motivational system functioning.

Aetiology of SAD

A range of genetic, temperamental, cognitive, and environmental factors have been implicated in understanding the development of SAD (see Beidel & Turner, 2007 for a review). No integrative model incorporating these factors has been tested to date; however, it has been hypothesised that a conglomeration of these factors is most likely involved in predisposing and precipitating SAD (Beidel & Turner, 2007; Kimbrel, 2008).

There is substantial evidence to demonstrate that genetic factors play a significant role in the aetiology of SAD (Kendler, Karkowski, & Prescott, 1999; Nelson et al., 2000; Stein, Jang, & Livesley, 1999). Older studies reported elevated levels of social anxiety in relations of individuals with SAD (Fyer, 1993; Fyer, Mannuzza, Chapman, & Martin, 1995). In addition, a number of twin studies have suggested a genetic influence to moderately contribute to the development of SAD and social anxiety (Kendler, Neale, Kessler, & Heath, 1992; Nelson, 2000; Stein, Jang, & Livesley, 2002). There is, however, debate regarding the specificity of this predisposition (Kimbrel, 2008). Indeed, findings
have demonstrated that children with parents who have SAD are more likely to have a number of different anxiety disorders than children of parents without SAD (Mancini, Van Ameringen, Szatmari, Fugere, & Boyle, 1996). This suggests that genetics may be responsible for exposing people to particular vulnerabilities, for example sensitivity to fearful, threatening or punishing stimuli, which may predispose them to a number of disorders, including SAD.

One such vulnerability pertinent to the current thesis is behavioural inhibition (Kimbrel, 2008), a temperament style which is observed in young children characterised by shyness, reservedness, avoidance, decreased appetitive behaviour, in addition to physiological arousal which is increased in novel situations (Wittchen, et al., 1999). Behavioural inhibition in childhood significantly increases the risk of developing SAD (Schwartz, 1999), in particular the generalised subtype (Schwartz, 1999; Wittchen, et al., 1999).

Environmental factors such as observational learning, direct conditioning, and peer relations have also been shown to be implicated in understanding social anxiety (Öst, 1985; Stemberger, Turner, Beidel, & Calhoun, 1995). In one study, 56% of participants retrospectively attributed precipitants for the onset of SAD to a direct conditioning or traumatic event (Öst, 1985). In another study, 56% of participants with S-SAD and 40% of those with G-SAD identified a traumatic conditioning event as a precipitant to the onset of their anxiety disorder (Stemberger, et al., 1995). These studies did however contain a retrospective bias that may have influenced results. There is some evidence that parents model and reinforce anxious avoidant behaviour to their children. For example, Barrett, Rapee, Dadda and Ryan (1996) presented anxious and non anxious children with ambiguous scenarios and measured their responses before and after a family
consult. Individual responses to threat for anxious children were found to be more avoidant in nature when compared to controls; moreover, the percentage of avoidant responses provided by the anxious children prior to the discussion with their family (30%) more than doubled after a discussion with their parents (68%). These results highlight the role of familial learning in the development of anxious and avoidant behaviours.

**Motivational Models in Understanding AUDs**

A number of studies have reported that alcohol activates neural systems associated with appetitive motivation (e.g., Bjork, Knutson, & Hommer, 2008; Gatto, McBride, Murphy, Lumeng, & Li, 1994; Schroeder, et al., 2008). It is suggested that alcohol is involved in activating dopaminergic pathways in the mesolimbic and mesocortical systems, both of which are implicated in reward and addiction (Wise, 1998; Wise & Bozarth, 1987). Appetitive motivational models of alcohol use focus on the positive reinforcing effects of consumption (Stewart, et al., 1984; Wikler, 1948; Wise, 1998; Wise & Bozarth, 1987). Such models propose that individuals engage in hazardous alcohol use due to the initial euphoric feelings alcohol promotes. This rewarding experience then reinforces the approach behaviour thus maintains the alcohol use (Stewart, et al., 1984). Earlier theorists have applied aversive motivational approaches, that is models of negative reinforcement, to drinking behaviour (Wikler, 1948; 1974). However, such models were unable to account for the role of positive reinforcement in the development and maintenance of alcohol use.

**Aetiology of Co-morbid SAD and AUDs**

There are a number of hypotheses that have been derived to explain the high SAD-AUD co-morbidity rates, all of which are based on the assumption that
SAD precedes problematic alcohol use (Buckner, et al., 2008; Falk, et al., 2008). For example, it has been suggested that those with SAD use alcohol due to its anxiolytic properties (known as the ‘Tension-reduction theory’) (Conger, 1951; Kushner, et al., 1990), that individuals consume alcohol in anticipation of anxiety provoking situations (‘Stress Response Dampening’ model) (Sher & Levenson, 1982), or that the properties of alcohol provides relief from the anxiety symptoms (‘Self Medication Hypothesis’) (Carrigan & Randall, 2003). Baker et al. (2004) have proposed that negative reinforcement processes are involved in motivating alcohol use in substance dependent individuals. Rather, they argue that there is substantial evidence to suggest that negative affect is an archetypal precipitant to substance use and relapse from abstinence specifically in individuals with substance dependence. Based on their review of the literature, they argue that negative reinforcers are typically associated with negative affect associated with increasing awareness of withdrawal symptoms and length of time since the substance was last consumed. They indicate that, less commonly, external stressors can lead to increased awareness of negative affect which can be alleviated by use of the dependent substance which is then reinforced by the reduction in distress. All of these theories argue that alcohol use is developed and maintained via negative reinforcement, as the negative aversive state (anxiety/negative affect) is decreased by consuming alcohol.

There has, however, been mixed support for the negative reinforcement hypothesis of alcohol consumption (Amit & Brown, 1982; Cappell & Greeley, 1987). A number of studies spanning many years have indicated that animals demonstrate no change or actually reduce their ethanol intake when exposed to stress (Champagne & Kirouac, 1987; Cicero, Myers, & Black, 1968; Ng Cheong
Ton, Brown, Michalakeas, & Amit, 1983; Volpicelli, Ulm, & Hopson, 1990), the early findings of this nature leading others to question why the link between anxiety and alcohol use is so widely accepted (Nathan & O'Brien, 1971). Moreover, the notion that alcohol is taken to alleviate anxiety has also been criticised as it does not explain why some anxious individuals turn to alcohol, whilst others do not (Wise & Bozarth, 1987).

In addition, such aversive models do not account for the strong support for the role of positive reinforcement in the development and maintenance of alcohol use (Stewart, et al., 1984; Wikler, 1948; Wise, 1998; Wise & Bozarth, 1987). Such theories have arisen from the study of other behaviours such as eating, drinking, sexual behaviour, and movement towards electrical brain stimulation (Stewart, et al., 1984; Wise & Bozarth, 1987). This is because similar appetitive processes are thought to underpin these behaviours which serve to act as appetitive motivators which precipitate behavioural movement towards the stimuli (Stewart, et al., 1984; Wise & Bozarth, 1987). Unlike appetitive behaviours such as seeking out food and water, there is no need for deprivation or an aversive state to motivate the initiation of substance use. Rather, it has been suggested that substances are self administered due to the pleasure inducing properties elicited by doing so (Stewart, et al., 1984). It has been suggested that these positive reinforcement processes involved in motivating alcohol use are homogenous to those underpinning other substances such as barbiturates, benzodiazepines, and cannabis by activating the medial forebrain bundle (e.g., the ventral tegmental area, the nucleus accumbens, the amygdala) and are associated with areas of the brain which regulate naturally occurring rewards such as satiety of thirst and hunger (Wise, 1998; Wise & Bozarth, 1987).
Thus, whilst it is clear that aversive processes are involved in understanding social anxiety and appetitive processes are implicated in the motivation to drink alcohol, there is currently no model which integrates these factors to explain co-morbidity. It is argued below that an issue which has not been thoroughly addressed by prior literature is the extent and process through which aversive and appetitive motivational influence drinking behaviour in individuals with social anxiety.

It is further proposed that current motivational models do not provide an understanding of how both of these processes may explain co-morbidity in this population, nor allow for an understanding regarding how these factors may differ between individuals. "Reinforcement Sensitivity Theory" (RST) may be applied to address these issues, as it encapsulates both aversive and appetitive motivation in an integrated model (Gray, 1987a; Gray & McNaughton, 2000). Moreover, RST can account for individual variation in these processes. Thus, it is proposed that drawing on RST as a theoretical framework may assist in better understanding individual variability in the motivational processes which underlies co-morbid social anxiety and alcohol use. The following section will describe RST and evaluate the literature applying to RST in social anxiety and alcohol use.
Chapter Two: The Development of Reinforcement Sensitivity Theory

Overview

Originally developed by Gray (1970; 1982; 1987a), RST is a model which accounts for the underlying psychological and neural processes involved in motivating approach and avoidant behaviour. RST has undergone a major revision (Gray & McNaughton, 2000), however much of the literature utilising RST still refers to the original conceptualisation. For this reason, the following section will describe the development and foundations of Gray’s (1970) original account of RST. This will be followed by a discussion regarding the changes to this model, and what adaptations will be needed to accommodate the new conceptualisation in upcoming research.

Foundations of RST

In order to understand the foundations of Gray’s RST (1970), one must consider the work of Hans Eysenck (1967) as it was he who developed a theory of personality that spearheaded further consideration of the neuroscience underpinning personality (Corr, 2004). Eysenck postulated that the personality facets, extraversion and introversion, were closely associated with individual differences in cortical arousal. Specifically, introverts were thought to have higher levels of cortical arousal when compared with extroverts, and are more arousable in response to stimuli in their environment. Indeed, extraverts have been shown to seek out stimulation in their environment and tend to prefer more arousing activities (Furnham, 1981). Another dimension, neuroticism, was thought to be related to emotional dysregulation stimulated by activation of the limbic system (Mathews & Gilliland, 1999) and has been shown to be associated
with various psychopathology including mood and anxiety disorders (Kercher, Rapee, & Schniering, 2009).

Eysenck's (1967) theory was developed using a 'top-down' approach which entailed finding personality structure through statistical analysis, after which he made causal links to a very small number of neurological systems (namely, the Ascending Reticular Activating System). Gray's (1970; 1982; 1987a; Gray & McNaughton, 2000; Pickering & Gray, 1999) theory was developed through a 'bottom-up' process whereby he investigated the biological properties of neurological systems to determine sources for individual differences seen in human behaviour, before making links between these systems and predetermined measures of personality.

Gray (1970; 1982) proposed that it was individual differences in these systems that determined personality. Based on this approach, Gray agreed with Eysenck's (1967) proposal that arousal differed for introverts and extraverts; specifically, that introverts have a higher baseline arousal and are subsequently sensitive to arousing stimuli. However, Gray (1970) qualified this theory by identifying differences in the stimuli which increased arousal in introverts and extraverts (see Figure 2.1). In particular, Gray specified that introverts were more sensitive to potentially punishing or threatening stimuli in their environments. Adversely, he specified that extraverts are more sensitive to rewarding stimuli or cues in the environment which signalled reward. Gray conceptualised Neuroticism as a personality factor considered to exacerbate responses to both punishment and rewarding stimuli (Gray, 1970). Thus, Gray proposed changes to Eysenck's (1967) model whereby the extroversion and introversion axis were rotated by 30 degrees to form the axis representing BIS/punishment sensitivity.
which leads to _anxiety_ and BAS/reward sensitivity reflecting _impulsivity_ (Gray, 1982) (see Figure 2.1). He purported that BIS should be positively related to Eysenck’s (1967) neuroticism and negatively related to extraversion, while BAS was considered to be positively related to neuroticism and extraversion (Gray, 1982). Since this theory was developed it has produced a large and influential body of literature and has more recently been substantially revised. The original conceptualisation of RST and its revisions will be discussed in further detail below.

**Gray’s Original Theory of Personality: The BIS, the BAS, and the FFS**

Gray (1970;1982;1987a) posited biological underpinnings of anxiety derived from animal learning research. Gray (1970) originally postulated three motivational systems controlling behaviour and emotion, the Behavioural Inhibition System (BIS), the Behavioural Activation System (BAS), and the Flight-Freeze System (FFS). The most important system in Gray’s (1982) theory was the α-BIS, which was thought to respond to novel and conditioned threat stimuli with aversive motivation (i.e., inhibition and negative affect). The
primary purpose of the o-BIS was to inhibit behaviour in response to potential punishment, and is proposed to underlie trait anxiety.

In contrast, the o-BAS was considered to be activated by conditioned stimuli that indicate reward or relief from punishment; activation of this system increases appetitive behaviour. When the o-BAS is activated, individuals are more likely to display approach behaviour and experience pleasurable affect in response to rewarding stimuli (Gray, 1982).

The third system, the Fight-Flight System (FFS), was thought to mediate responses to unconditioned aversive stimuli (e.g., in response to snakes or spiders) (Gray, 1987b). When confronted with aversive stimuli, the individual was said to either flee rapidly (flight) or defends the self with aggression (fight). The FFS was considered to be associated with emotional states, specifically rage and panic, and was also considered to be sensitive to pain stimuli. The FFS was not linked to personality and was considered to be the least clearly defined system of o-RST (Torrubia, Avila, & Caseras, 2008).

**Revision of RST; the r-BIS, r-BAS, and FFFS**

As mentioned, RST has undergone substantial revision (Gray & McNaughton, 2000) in order to account for current understandings of both new and old animal data (Blanchard, Griebel, & Blanchard, 2001; Blanchard, Blanchard, & Hori, 1989; Smillie, Pickering, & Jackson, 2006). The revisions change the conceptualisation of the original motivational subsystems, the o-BIS and o-BAS, in addition to accommodating a new system termed the Fight-Flight-Freeze system (FFFS) which has replaced the FFS.

**The Behavioural Activation System (BAS).** As can be seen in Figure 2.2, the BAS remains largely unchanged by the revisions. However, it is now
predicted to mediate reactions to all appetitive stimuli, conditioned and unconditioned. The r-BAS maintains its role in facilitating positive affect and "anticipatory pleasure" by motivating goal directed behaviour towards a reinforcer (Corr, 2008b; Corr & Perkins, 2006; Smillie, 2008b). Individual differences in r-BAS reflect the level of sensitivity to reward in general, and generate appetitive behaviour towards the reinforcer, reducing the "temporo-spatial distance" between the goal state and the rewarding stimuli (Gray & McNaughton, 2000, p. 40).

The neurological underpinnings of the r-BAS are thought to be in the basal ganglia (implicated in behavioural activation), the ventral tegmental area (VTA; associated with dopamine release), the ventral striatum including the nucleus accumbens and is innervated by the projection of dopaminergic fibers from the VTA (related to emotional behaviour, motivation) and the prefrontal cortex (executive function, planning) (Brodie & Appel, 2000; Brown, Bullock, & Grossberg, 1999; Knutson & Cooper, 2005; Schultz, 1998; Schultz, Tremblay, & Hollerman, 2000; Wise, 1998).

**The Fight-Flight-Freeze System (FFFS).** Whilst the r-BAS facilitates responses to all appetitive stimuli, the FFFS is now conceptualised as the system responsible for mediating responses to all aversive stimuli. The FFFS is now considered to respond to punishment stimuli, which was previously attributed to the o-BIS in the original model. However, unlike the r-BIS which is now associated with anxiety, the FFFS is involved in the emotion of fear (McNaughton & Corr, 2004). The FFFS is the system which stimulates the flight response in aversive situations so it is not surprising that it is responsible for avoidance and escape behaviours by motivating defensive behaviour away from a threatening
state to a more comfortable one (Corr, 2004; 2008b; Corr & Perkins, 2006; Nutt, Bell, & Malizia, 1988; Smillie, et al., 2006). Hyperactivity of the FFFS has been implicated in anxiety disorders such as panic disorder and specific phobias (Gray & McNaughton, 2000).

Behaviours observed from activation of the FFFS are highly influenced by environmental factors (Smillie, 2008b). For example, rodent studies have demonstrated that proximal threats will elicit a defensive fight or attack response (orientation towards threatening stimuli), distal threats typically evoke an escape or flight response (orientation away from threat), and when escape is impossible and the threat proximal the animal will typically freeze (Blanchard & Blanchard, 1990; Blanchard, et al., 1989). There is some evidence that such ecological factors are transferable to understanding humans; however only a small number of studies have investigated this in human populations (Blanchard, Hynd, Minke, Minemoto, & Blanchard, 2001; Perkins, Cooper, Abdelall, Smille, & Corr, 2010; Perkins & Corr, 2006). The role of threat perception and defensive direction will be discussed in greater detail below.

The FFFS is thought to comprise neurological systems such as the periaqueductal gray (involved in panic/freeze behaviour), the medial hypothalamus (escape behaviours), the amygdala (arousal), and the anterior cingulate (rumination/simple obsessions) (McNaughton & Corr, 2008; Smillie, 2008b). Whilst Fight, Flight and Freeze are controlled by independent neurological systems and produce functionally independent behavioural outcomes, they interact to form one functional system, the FFFS, to accomplish the same purpose – that is, to motivate avoidance of threat (Eilam, 2005).
The Behavioural Inhibition System (BIS). As mentioned, the BIS was originally conceptualised to mediate sensitivity to conditioned punishment stimuli (Gray, 1982); which, in addition to accommodating unconditioned stimuli, is now the domain of the FFFS (Gray & McNaughton, 2000). Now the BIS is considered to be the _defensive approach_ subsystem. That is, the r-BIS is responsible for resolving goal conflicts, such as the conflict between approach (r-BAS) and avoidance (FFFS) (Corr, 2004). This process highlights a factor not clearly conveyed in the original theory (Gray, 1982), that the perception and appraisal of threatening stimuli is integral to the response to threats (Gray & McNaughton, 2000). In order to complete this process, higher order cognitive mechanisms are utilised. Specifically, the septo-hippocampal system (aversion/cognition), the amygdala (arousal/startle), the medial hypothalamus (risk assessment), the posterior cingulate (rumination), and the prefrontal dorsal stream (complex anxiety) are considered integral to r-BIS function (Gray, 1982; McNaughton & Corr, 2008).

Activation of the r-BIS system is thought to inhibit approach behaviour by increasing arousal, attention, initiating caution and by conducting risk assessments in conflict situations (Gray & McNaughton, 2000; Smillie, 2008b). When conducting a risk assessment, the r-BIS initiates processes such as memory scanning and evaluation of the environment to assist in resolving the goal conflict. When the r-BIS is activated, the FFFS and r-BAS are initiated until a resolution is made to either approach (r-BAS) or avoid/flee from (FFFS) the threatening stimuli (Corr, 2011). Gray and McNaughton (2000) reported that the r-BIS has a bias towards perceived threatening situations, tending to favour avoidant responses by activating the FFFS. If one is highly r-BIS sensitive, the individual
is thought to demonstrate dysfunctional levels of risk aversion and experiences anxiety (Corr, 2008b).

**Defensive Direction and Distance**

Based on extensive animal literature (Blanchard, Hynd, et al., 2001; Blanchard & Blanchard, 1989; Blanchard, Griebel, Henrie, & Blanchard, 1997) revisions to RST also assert that defensive behaviour (e.g., approach, avoid, fight) is contingent upon "defensive direction" (Gray & McNaughton, 2000). This distinguishes between threats that elicit fear and avoidance (e.g., a snake) and those threats which require approach, leading to anxiety and a risk assessment (e.g., a snake near a young child). R-RST postulates that those high in trait anxiety are more inclined to perceive a stimulus requiring approach as threatening, and those high in trait fearfulness are more sensitive to threats which to not require approach (Gray & McNaughton, 2000; Perkins, et al., 2010).

"Defensive distance" is another r-RST construct thought to apply equally to fear and anxiety (Gray & McNaughton, 2000). Defensive distance details how a behavioural response to threat is conditional on the perception of how close (proximal) or far away (distal) the threat is (see Eilam, 2005 for a review). This distance can be indicative of actual physical distance, or, in situations of exposure to extreme threat this distance is shortened and represents perceived distance. Proximal threats are thought to activate lower neural levels (e.g., the periaqueductal gray) which initiate ingrained responses such as fight, flight, and freezing. As the threat is perceived to be more distant, it increasingly activates higher neural networks (e.g., the prefrontal cortex) which elicits more complex and considered responses such as that required for risk assessment or rumination.
Some individuals (e.g., those with elevated FFFS) are more susceptible to perceiving threat as more proximal, and intensely react to stimuli which others may interpret as harmless (Corr, 2008b; Gray & McNaughton, 2000).
Figure 2.2. The role of RST mechanisms (FFFS, r-BIS, r-BAS) in responding to ecological reinforcers (punishment and rewarding stimuli), stimulating defensive direction (defensive approach/avoidance/non defensive approach), and the affective consequences of activation of the RST systems (fear/anxiety/positive affect). FFFS and r-BAS serve to activate r-BIS if they are jointly activated which signifies a goal conflict (approach-avoidance); when this occurs, r-BIS has a bias towards perceived threat, favouring the FFFS over the r-BAS when conducting risk assessments. FFFS activation by punishing stimuli inhibits the r-BAS and r-BAS activation by reward inhibits the FFFS. When the FFFS is activated, orientation is away from threat and the emotional output is fear. When the r-BIS is activated there is a cautious approach towards threat and anxiety. The r-BAS is sensitive to rewarding stimuli which elicits approach behaviour and positive affect. Adapted from —What is Reinforcement Sensitivity? Neuroscience Paradigms for Approach-avoidance Process Theories of Personality” by L.D. Smillie, 2008, European Journal of Personality, 22, p. 362.
Conceptual Differences Between the New and Old RST

In sum, the new theory differs from the prior in the following ways:

1) There is now a clear distinction between fear and anxiety, whereby the role of fear is to move the individual away from a threat, whereas in an approach-avoidance conflict situation movement is made towards the threat resulting in anxiety (McNaughton & Corr, 2004). The importance of this distinction in relation to social anxiety will be discussed in chapter three.

2) The r-BAS is now conceptualised as mediating responses to all appetitive stimuli, not just conditioned stimuli as was originally understood. The r-BAS remains the system responsible for reward sensitivity.

3) The FFFS, rather than the r-BIS, is now thought to be the punishment system, mediating responses to all aversive stimuli. The FFFS is now responsible for an individual’s fear sensitivity.

4) The r-BIS is now activated by conflict such as approach-approach conflict (e.g., two competing job offers), approach-avoidance (e.g., deciding whether to eat a satisfying high fat food when on a diet) avoidance-avoidance (establishing which way to escape from threat when more than one option is present), and is responsible for resolving these conflicts via the conduction of risk assessment. The r-BIS is now responsible for the experience of anxiety (Gray & McNaughton, 2000). Specifically, when there is a conflict between approach (r-BAS) and avoidance (FFFS), the concurrent activation of these systems is now mediated by the r-BIS, resulting in anxiety.
R-RST Measurement Issues

Existing measures of the original RST, e.g., the BIS/BAS scales (Carver & White, 1994), and the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia, Avila, Molto, & Caseras, 2001), have been considered to be inconsistent with the revised theory due to their inclusion of fear in their measurement of the BIS (Smillie, et al., 2006). This is particularly pertinent in understanding measurement of the revised RST given that there is now a clear delineation between fear and anxiety. Specifically, the r-BIS is responsible for anxiety and the FFFS is considered to be associated with fear (Gray & McNaughton, 2000). Furthermore, such scales fail to encapsulate goal conflict, a concept now integral in understanding the role of the r-BIS (Smillie, et al., 2006). Revised RST has not been utilised in understanding social anxiety or alcohol use in the literature to date. Instead literature continues to be published (e.g., Kashdan & Roberts, 2006; Kimbrel, et al., 2008) using measures developed to assess the original conceptualisation, which are not accurate representations of Gray and McNaughton’s (2000) r-BIS, and which are based upon outdated biological data (Smillie, et al., 2006). Until now, no measure has captured these important modifications to the theory. However, Jackson (2009) has recently addressed these and other changes made in the revision of RST by developing a valid and reliable measure of r-BAS, r-BIS, and FFFS. As will be shown, the changes to RST are of particular relevance to the study of co-morbid social anxiety and alcohol use disorder. Thus, the utilisation of updated RST measures will provide an avenue to gain a clearer understanding of alcohol use for individuals with social anxiety.
In sum, based on updated animal data revisions to RST were made which derive the punishment system (o-BIS) into two separate systems responsible for fear (FFFS) and anxiety (r-BIS). There were minimal changes made to the BAS which remains the system sensitive to rewarding stimuli and responsible for motivating appetitive behaviour. There is a dearth of research investigating RST in relation to social anxiety and alcohol use, and none have applied the revised model in assessing this population. This is despite the clear applicability of r-RST in understanding fear and avoidance (FFFS), anxious approach (r-BIS) (Gray & McNaughton, 2000; Smillie, et al., 2006), and appetitive behaviour towards rewarding stimuli such as alcohol use (BAS) (Franken & Muris, 2006; Kambouropoulos & Staiger, 2001;2004; O'Conner & Colder, 2005). The following chapter will discuss r-RST in understanding the relationship between social anxiety and hazardous alcohol use.
Chapter Three: Understanding the Relationship between Social Anxiety and Alcohol Use using R-RST

Overview

As previously mentioned, r-RST (Gray & McNaughton, 2000) has clear relevance for understanding social anxiety and hazardous alcohol use. R-RST offers a framework which provides an understanding of individual differences in aversive and appetitive motivational processes which may provide a clearer understanding of the development of hazardous drinking in individuals with subclinical levels of social anxiety.

The following sections will review the empirical research investigating o-RST in understanding social anxiety. In particular it will be argued that based on a theoretical understanding of r-RST, social anxiety, and on findings derived from the o-BIS literature (e.g., Kashdan & Roberts, 2006; Kimbrel, et al., 2010), the FFFS and r-BIS will be the most important r-RST systems underpinning social anxiety. Whilst the SAD-AUD co-morbidity has been proposed to be explained by the FFFS and r-BIS (Kimbrel, 2008), empirical research investigating appetitive motivational processes in understanding hazardous drinking indicate that BAS is the most important motivational system (e.g., Franken, 2002; Kambouropoulos & Staiger, 2001;2004;2007; Loxton & Dawe, 2001). Thus, by extension it is argued that the r-BAS is the system responsible for motivating alcohol use in socially anxious individuals.

RST and Social Anxiety

Despite changes to RST, its principal focus of a neurological explanation of anxiety as determined by activation of the BIS, remains the same (Gray, 1982;
Gray & McNaughton, 2000). The r-BIS mediates the response to dangerous stimuli which precedes the evaluation of conflicting behaviours, conducts risk assessments, and comes to a resolution of the conflict which results in anxiety. Elevated levels of r-BIS causes hyper-vigilance towards danger as the individual is consistently on the lookout for threat in their environment (Corr, 2008b).

Unlike other disorders (e.g., schizoid personality disorder) individuals with social anxiety want to be engaged in social relationships (APA, 2000). However, in social situations they are faced with a goal-conflict. They inevitably seek the benefits associated with social inclusion and participation (APA, 2000); however, they are hyper-vigilant to internal cues of fear of negative evaluation and anxiety (Weeks, Heimberg, Rodebaugh, & Norton, 2008).

Gray and McNaughton (2000) have implicated components of r-RST in understanding specific phobias which has ramifications for our understanding of social anxiety. The model suggests that phobic stimuli are often phenomenon that can be highly threatening to humans (e.g. snakes, spiders) and for this reason these stimuli elicit an unconditioned fear response in individuals with specific phobias. The development of a phobia is thought to involve, in addition to other factors, innate fear responses as mediated by the FFFS. Whilst such responses are applicable to SAD, social phobias’ are more complex. This is because social situations have the potential to offer both rewards (e.g. friendship, companionship, protection) in addition to aversive emotions associated with perceived threat (e.g. risk of negative appraisal); thus an approach-avoidance conflict may exist. In social situations people with elevated social anxiety experience a conflict in which the potential benefits and risks are weighed up prior to a resolution to approach anxiously or flee/avoid the situation (Kimbrel,
2008). It is for this reason that it has been suggested that activation of the FFFS and r-BIS are the most important systems for understanding heightened social anxiety (Corr, 2011; Gray & McNaughton, 2000). A small amount of r-BAS activation may also be prevalent when there is an approach (r-BAS)-avoidance (FFFS) conflict as the individual performs a risk assessment (r-BIS) to determine whether appetitive (r-BAS) or aversive (FFFS) orientation is appropriate.

Although RST is theoretically relevant in understanding social anxiety, only a small number of empirical studies have investigated this, none of which have applied the revised theory (Booth & Hasking, 2009; Coplan, et al., 2006; Kashdan, 2002; Kashdan & Roberts, 2006; Kimbrel, 2008; Kimbrel, et al., 2010). Using the original conceptualisation of RST, studies have found elevated sensitivity to punishment to be positively associated with social anxiety in children (Coplan, et al., 2006) and undergraduate university students (Kashdan & Roberts, 2006; Kimbrel, et al., 2008). The following section will evaluate the empirical evidence of RST and social anxiety as well as a theoretical model of understanding revised RST and social anxiety.

**SAD and the Original RST: Empirical Evidence**

Six studies to date have investigated the original conceptualisation of RST and social anxiety (Booth & Hasking, 2009; Coplan, et al., 2006; Kashdan, 2002; Kashdan & Roberts, 2006; Kimbrel, et al., 2008; Kimbrel, et al., 2010) offering support for the role of RST in understanding variation in social anxiety symptoms. Four of these articles were driven by the contention that the o-BIS was thought to be responsible for predisposing individuals to the inhibition of approach behaviour, avoidance, fear and anxiety (Coplan, et al., 2006; Kashdan & Roberts, 2006; Kimbrel, et al., 2008); that is, the characteristics of elevated social
anxiety. In general, these studies have argued that individuals who are hypersensitive to punishing stimuli would be more likely to be sensitive to aversive social cues (e.g., criticism, negative evaluation from others) and thus experience extreme anxiety and avoidance of social situations (e.g. Kimbrel et al., 2008). One study, Kimbrel et al. (2010) proposed that lower levels of o-BAS in conjunction with elevated o-BIS are involved in underpinning the development of generalised SAD (G-SAD). This hypothesis was made based upon Corr’s (2002a) Joint System’s Hypothesis (JSH) which specifies antagonistic and facilitative interaction between RST systems under certain conditions. Another study suggested that those with elevated levels of social anxiety would report lower levels of o-BAS (Kashdan, 2002). Whilst Kashdan (2002) did not directly discuss the JSH in justifying the o-BAS involvement in understanding social anxiety, nor did they measure o-BIS, interaction between these RST systems was implied. Specifically, it was argued that individuals with heightened social anxiety are likely to have elevated o-BIS which motivates avoidance of distress –in lieu of pursuing rewards and pleasures” (p. 792) thus resulting in lower levels of o-BAS. These five studies will be independently reviewed in detail below. One of these studies will be reviewed in a subsequent chapter as researchers investigated social anxiety and co-morbid alcohol use (Booth & Hasking, 2009).

In one such study, Kashdan and Roberts (2006) investigated o-RST in understanding social anxiety by administering self-report assessments in conjunction with behavioural tasks to an undergraduate sample. Tasks required social interaction with a confederate (study 1) or another participant (study 2). Self-report data indicated moderate to strong positive correlations across both studies between self-report sensitivity to threat (BIS scale; Carver & White, 1994)
and a measure of social interaction anxiety (SIAS; Mattick & Clarke, 1998) which is a type of social anxiety precipitated by direct contact with social situations (e.g., talking to an attractive person at a party, making eye contact while talking). Furthermore, results derived from both behavioural tasks indicated that participants with elevated social anxiety reported more interpersonally generated negative affect than those with lower levels of social anxiety. No significant relationship was found between o-BAS and social anxiety. Collectively, results indicate that social anxiety is associated with hypersensitivity to threatening stimuli (o-BIS) as well as state negative affect (PANAS; Watson, Clark, & Tellegen, 1988); whereas appetitive motivation was not important. As o-BIS comprises elements of r-BIS and FFFS, these findings are consistent with the proposition that these r-RST systems are implicated in understanding social anxiety.

In another study involving 95 children (Coplan, et al., 2006) self report measures of o-BIS and o-BAS (BIS/BAS scales; Carver & White, 1994), in addition to a measure used to assess child social anxiety (The Social Anxiety Scale for Children and Adolescents; LaGreca, 1998) were administered. Results were consistent with those demonstrated by Kashdan and Roberts (2006) in that sensitivity to punishment was found to be positively correlated with fear of negative evaluation (FNE), social avoidance and distress in novel situations, and generalised social distress (GSD) and avoidance. Incongruent to the aforementioned study, Coplan et al. (2006) found o-BAS to be negatively associated with FNE and GSD. Results suggest that there is an important role for both appetitive and aversive motivational processes in understanding social anxiety. That is, heightened punishment sensitivity and lower levels of reward
sensitivity were found to be associated with the types of fear and avoidance typically seen in people with heightened social anxiety. This finding is consistent with Kimbrel’s (2010) proposition that social anxiety is associated with aversive and appetitive motivation; specifically, that social anxiety is associated with an increase in general sensitivity to punishing stimuli and negatively related to sensitivity to rewarding stimuli. Moreover, given measures of o-BIS contain elements of fear and anxiety output, results appear to be consistent with Kimbrel’s (2008) hypothesis that the FFFS and o-BIS are associated with social anxiety.

In another study, Kimbrel et al. (2008) administered a self-report measure of r-RST (SPSRQ; Torrubia, et al., 2001) and the Social Phobia Scale (Mattick & Clarke, 1998), a measure of social performance anxiety, to 128 female university students. Social performance anxiety refers to anxiety experienced when under pressure to perform (e.g., speaking, writing, or talking in front of others). This study also investigated the role of parenting in the association between Bulimia Nervosa and SAD; however, only results pertaining specifically to RST and SAD will be discussed. Results derived from the self report data indicated a moderate strength significant relationship between o-BIS and SAD symptoms. Incongruent with studies that found aversive and appetitive motivational processes to be associated with social anxiety (Coplan, et al., 2006; Kimbrel, et al., 2010) there was no significant relationship between o-BAS and social anxiety. Consistent with previously discussed studies (Kashdan & Roberts, 2006; Kimbrel, et al., 2010) this study highlights the importance of aversive motivational processes in understanding social anxiety. Despite this, this study does not offer the opportunity to investigate threat sensitivity and goal conflict resolution
independently. Furthermore, the role of BAS in understanding social anxiety is less clear and requires further research.

Kimbrel et al. (2010) also postulated that o-BIS and o-BAS would play a role in understanding different elements of social anxiety, social interaction and social performance anxiety (Mattick & Clarke, 1998). Specifically, Kimbrel et al. (2010) hypothesised that o-BIS was the primary mechanism for understanding social anxiety and also investigated whether o-BAS was negatively related to social interaction anxiety but not associated with social performance as has been demonstrated in one prior study (Kashdan, 2002). These predictions were based on Corr’s (2002b) joint subsystems hypothesis which has hypothesised that o-BIS and o-BAS exhibit both facilitatory (o-BIS facilitates sensitivity to punishment, and o-BAS reward sensitivity) and antagonistic effects on behaviour. Results from the Kimbrel et al. (2010) study across three samples of American psychology students (560 in total) indicated that o-BIS was the most important predictor of both social interaction and social performance anxiety. O-BAS was negatively associated with social interaction anxiety, even after accounting for the effect of positive affect; however, there was no significant relationship between o-BAS and social performance anxiety. Results indicate that there are some quantitative differences between subtypes of social anxiety, highlighting the need to not only investigate social anxiety as a unitary construct but also as two distinct subtypes.

Interestingly, Kimbrel et al. (2008, 2010) selected to measure combined r-BIS and FFFS sensitivity using the SPSRQ which is a measure of sensitivity to punishment (o-BIS; Torrubia, et al., 2001) that does not distinguish between fear and anxiety. They justified this by citing Corr’s (2004) argument that o-BIS
measures reflect combined activity of both the r-BIS and the FFFS. However, whilst Corr (2004) acknowledged that research currently considered punishment sensitivity to be related to a combination of r-BIS and FFFS functioning, he also stressed the need for the dissociation of these systems in future work. Moreover, other studies have highlighted the importance of distinguishing fear and anxiety, particularly as it has been suggested that older measures (e.g., SPSRQ, BIS/BAS scales) are representative of both FFFS and o-BIS functioning and often fail to capture goal conflicts which are now thought to activate the r-BIS (Smillie, et al., 2006). Further research is clearly required to delineate and measure FFFS and r-BIS functioning in understanding social anxiety.

Finally, Kashdan (2002) assessed the role of o-BAS in understanding social interaction and social performance anxiety in a sample of 204 undergraduate psychology students. This study differed from the aforementioned research (e.g., Coplan, et al., 2006; Kimbrel, et al., 2008; Kimbrel, et al., 2010) as Kashdan (2002) was not interested in understanding the role of o-BIS as the purpose of this study was to test whether individuals high in social anxiety experienced disruptions to their experience of positive psychological functioning. Results indicated that there was a weak but significant negative correlation between o-BAS and social interaction anxiety, even after controlling for social performance anxiety. Whilst there was a very weak significant negative correlation between social performance anxiety and o-BAS, this relationship neared zero when social interaction anxiety was controlled for. This study provides some support for Kimbrel’s (2010) argument that social anxiety is in part explained by depressed reward sensitivity; however, Kashdan (2002) did not measure o-BIS in understanding social anxiety despite the clear applicability of
this system. Indeed, the prediction that o-BAS would be negatively associated with social anxiety was argued on the basis of prior research which had found significant positive relationships between o-BIS and social anxiety. This suggests that Kashdan was forming hypotheses utilising facilitatory and antagonistic processes highlighted in the JSH (Corr, 2002a), yet this was not explicitly discussed. This study highlights the importance of measuring appetitive and aversive motivational processes in relation to social anxiety.

In summary, results utilising the original conceptualisation of RST and measured by various scales (Carver & White, 1994; Torrubia, et al., 2001) have indicated that the o-BIS is the most pertinent motivational system in understanding social anxiety (Coplan, et al., 2006; Kashdan & Roberts, 2006; Kimbrel, et al., 2008; Kimbrel, et al., 2010). There have been mixed findings with regard to o-BAS and social anxiety with some studies finding significant negative correlations (Coplan, et al., 2006; Kashdan, 2002) and others reporting no relationship (Kashdan & Roberts, 2006; Kimbrel, et al., 2008). The following section will discuss the proposed role r-RST may play in understanding social anxiety.

The Integration of the Revised RST into a Theoretical Model of the Aetiology of SAD

Whilst empirical research is yet to relate the revised RST to understanding social anxiety, a recent publication has provided a theoretical account of the applicability of r-RST to this population (Kimbrel, 2008). Kimbrel (2008) proposed an extensive aetiological and maintenance model in which the revised RST was integrated with existing explanations of the disorder.
Specifically, Kimbrel suggested r-BIS and FFFS functioning is a result of genetic influence, predisposing people high in r-BIS and FFFS sensitivities to develop G-SAD. It was argued that the genes implicated in reduced serotonin availability in the neurological pathways in which the r-BIS and FFFS are implicated may be the same genes responsible for G-SAD (McNaughton & Corr, 2004). High levels of r-BIS and FFFS are thought to predispose high levels of shyness and behavioural inhibition in childhood and high levels of shyness, trait anxiety and neuroticism in adults. Furthermore, social experiences which cause hyper-vigilance in social situations (e.g. rejection by peers) are thought to increase the risk for generalised G-SAD by increasing FFFS sensitivity to social stimuli. Additionally, the r-BIS is thought to be involved in elevated stress responses to threatening stimuli (Kimbrel, 2008).

Moreover, the cognitive biases towards threatening stimuli which are highly common in individuals with SAD (Clarke & Wells, 1995) are also thought to be due to high r-BIS and FFFS sensitivity. This is because individuals high in r-BIS and FFFS are thought to be particularly sensitive to potentially threatening situations, experiencing increased arousal, inhibition, and risk assessment scanning as stimulated by the FFFS; as a consequence, causing fear of unfamiliar social situations which is disproportionate from the actual threat (Gray & McNaughton, 2000).

Although Kimbrel (2008) theorised that FFFS, in general, would be positively associated with social anxiety no consideration has been given to the role of this system’s specific components. As previously mentioned, Jackson (2009) has constructed a measure of revised r-RST which discriminates Fight, Flight, and Freeze into separable scales. These components may play a vital role
in understanding motivational behaviour underpinning social anxiety and the Jackson measure offers a method to investigate this. For example, social performance anxiety is characterised by fear and avoidance in situations in which one feels as though they are being observed or evaluated while performing a task (Mattick & Clarke, 1998). Avoiding these types of situations may be less difficult than avoiding general social experiences characterised in generalised social anxiety, as measured by the social interaction anxiety scale (Mattick & Clarke, 1998). Consequently, individuals with fears of specific social situations may perceive anxiety provoking situations to be more easily avoided, distal and thus freeze and flee. However, avoidance of many social situations is more difficult. As such, individuals with generalised social anxiety would be often required to face proximal threatening stimuli which may make them more inclined to engage in defensive fight behaviour (Blanchard, Griebel, et al., 2001; Blanchard & Blanchard, 1989). Despite the relevance of understanding FFFS/fear, r-BIS/anxiety, and defensive behaviour in understanding social anxiety; these factors have not been measured in the literature to date.

In sum, theoretically it appears that the components of r-RST may play a substantial role in understanding the aetiology and maintenance of social anxiety. Despite this, the revised theory has never been empirically tested to investigate such factors. Rather, current research has continued to utilise the original conceptualisation (Gray, 1982), potentially due to challenges faced in finding appropriate r-RST measures. Nonetheless, prior research has found sensitivity to punishment, in general, to be positively associated with elevated levels social anxiety in community populations (Coplan, et al., 2006; Kashdan & Roberts, 2006; Kimbrel, et al., 2008). The role of reward sensitivity is less clear. Two
studies have found o-BAS to be negatively correlated with social anxiety (Coplan, et al., 2006; Kashdan, 2002), which suggests that a reduced sensitivity to reward may be related to the experience of social anxiety, whereas two other studies found no correlation (Kashdan & Roberts, 2006; Kimbrel, et al., 2008).

Moreover, the components of FFFS may offer insights into understanding the two subtypes of social anxiety, particularly in response to different ecological stimuli. The following section will discuss two components of the revised theory, fear and anxiety, and the relevance of these two emotions in this population.

The Importance of Understanding Fear and Anxiety in Social Anxiety

Revised RST delineates fear and anxiety as separable emotions pertaining to two separate systems (McNaughton, 2011; Perkins, Kemp, & Corr, 2007). Gray and McNaughton (2000) maintain that fear and anxiety are derived by activity in different, yet interacting, systems within the brain which facilitate defensive direction. These systems facilitate avoidance of potential threats or defensive avoidance (FFFS/fear) in addition to allowing for approaching threat which assists in sustaining life known as defensive approach (r-BIS/ anxiety). Gray and McNaughton specify that there is a difference between individuals exiting a situation where there is a potential for threat (e.g., avoiding a person with whom they have previously had a conflict with) and when a person must enter an area where the threat is apparent (e.g., being forced to join a team where you know that person will be).

Whilst Gray and McNaughton (2000) argued that the emotions of fear and anxiety are separable based upon a plethora of animal studies, this distinction has more recently been established within human populations (e.g., Cooper, Perkins, & Corr, 2007; Perkins, et al., 2007). Such a proposal contradicts the well
established view that all negative emotions, including anxiety and fear, can be grouped into one personality variable referred to as neuroticism by Eysenck (1967). This has been investigated in a small number of studies in humans (Cooper, et al., 2007; Heym, Ferguson, & Lawrence, 2008; Perkins, et al., 2007).

**Fear and Anxiety as Separable Constructs; Empirical Evidence**

Trait fearfulness and anxiety have been found to be quantifiably separable constructs in a small number of studies (Cooper, et al., 2007; Heym, et al., 2008; Perkins, et al., 2007). Additionally, one study has demonstrated that fear and anxiety predicted different behavioural outcomes in a military setting (Perkins, et al., 2007). These studies, which offer support for the contention that fear and anxiety are separable constructs (Gray & McNaughton, 2000), will be reviewed independently below.

Perkins et al. (2007) sought to assess the inter-correlations between measures of neuroticism, fear and trait anxiety. This study implemented a unique design which permitted the examination of fear and anxiety in predicting unique variance in an applied task. Specifically, valid and reliable measures of fear (Fear Survey Schedule; FSS; Wolpe & Lang, 1964), anxiety (State Trait Anxiety Inventory; STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), o-BIS/o-BAS (BIS/BAS Scales; Carver & White, 1994), and Eysenck’s personality dimensions (Eysenck Personality Questionnaire; EPQ-R; Eysenck, 1967), were used to predict performance in a military training setting. This setting was deemed to be an appropriate threat stimulus as combat, even that which does not contain harm such as in a military training setting, is thought to evoke at least moderate levels of fear. Thus, this study offered an opportunity to measure the relatedness of fear and anxiety using psychometric measures and in prediction of
observable behaviours. It also served to offer evidence that fear scores, as measured by psychometric measures such as the FSS, predict behaviour in an expected manner; thus, offering support for the utility of such measures in settings outside of the clinical arena. Across both studies (N=242) the correlations between fear and anxiety were found to be smaller than the correlation between anxiety and neuroticism. Anxiety and neuroticism are often considered to be psychometrically analogous as measures of trait anxiety tend to correlate as strongly with measures of neuroticism as they do other measures of anxiety (Diaz & Pickering, 1993; Hagopian & Ollendick, 1996). Thus, the finding that fear and anxiety were less correlated than anxiety and neuroticism indicates that trait fearfulness and anxiety are measuring separable constructs. Fear was not only psychometrically distinguishable from anxiety but it also contributed to unique variance in the prediction of task performance which was not tapped into by any of the other personality variables. Moreover, correlations between o-BIS, fear and anxiety suggest that they may indeed be separable. Results provided preliminary support for Gray and McNaughton's (2000) separation hypothesis.

In an attempt to replicate these findings, Cooper et al. (2007) used the same measures to investigate the convergent and discriminant validity of fear, anxiety, and o-BIS in a community sample of 340 people. Results from confirmatory factor analyses performed indicated that fear (social and tissue damage fear), trait anxiety and o-BIS formed distinct factors demonstrating an excellent fit of the data. The finding that o-BIS loaded onto a separate factor to fear and anxiety is surprising given o-BIS measures are thought to contain elements of both fear and anxiety (Smillie, et al., 2006). However, o-BIS scales such as the Carver and White (BIS/BAS scales; 1994) measure used in this study
assess general sensitivity to punishment rather than the specific fears and anxieties captured by the FSS (Wolpe & Lang, 1977) and STAI (Spielberger, et al., 1983). Results offer further support for Gray and McNaughton's (2000) contention that fear and anxiety are indeed separable constructs.

Finally, Heym, Ferguson and Lawrence (2008) conducted a confirmatory factor analysis on data derived from the completion of the Carver and White (1994) BIS/BAS scales by 212 university students. Results indicated that a two factor model (r-BIS-anxiety, FFFS-fear) of the o-BIS subscale was a better fit than a one factor model. These studies support findings by researchers investigating the revised RST, which not only demonstrate measures of fear and anxiety to be relatively distinct, but have also offered support for the role of these dimensions in behavioural research (Cooper, et al., 2007; Perkins, et al., 2007).

As has been demonstrated, there is some evidence for the contention that fear and anxiety are separable in the general population (Cooper, et al., 2007; Heym, et al., 2008; Perkins, et al., 2007). However, prior research has not investigated the extent to which fear and anxiety are separable in relation to understanding social anxiety. This question is particularly interesting as individuals with heightened social anxiety are typically both fearful and anxious (APA, 2000; 2011). Thus, given fear and anxiety are commonly occurring symptoms in individuals with social anxiety it is an ideal variable to assess the separability of these two emotions. Should Gray and McNaughton’s (2000) revisions hold true, one would not expect high correlations between measures of fear and anxiety; moreover, these variables would independently predict social anxiety. Understanding these relationships may have repercussions for practice (i.e., tailoring treatment to fit with individuals differences) in addition to
theoretical implications (i.e., a better understanding of predisposing and maintaining factors). A better understanding of how fear and anxiety interact can provide insight into the aetiology and maintenance of social anxiety.

R-RST proposes that the role of fear is to motivate people away from threat (avoidance), whereas the role of anxiety is to motivate approach towards threatening stimuli when there is a goal conflict (anxiety provoking appetitive behaviour). Given hyper-vigilance to threat, fear of negative evaluation, and avoidance are characteristic of elevated social anxiety (Marcin & Nemeroff, 2003), it is likely that many situations which need to be approached evoke a fear response resulting in fear and anxiety. In situations which may readily be avoided, anxiety is averted yet the fear response may remain a strong aversive motivator. However, we can only speculate how these relationships may interplay due to the dearth of research in this area.

The aforementioned sections have highlighted the relevance of understanding RST in understanding social anxiety; however, r-RST also has particular applicability for understanding co-morbid hazardous alcohol use. Thus, the following section will first review the few studies associated with this co-morbidity followed by research associated with understanding hazardous alcohol use using o-RST as a theoretical framework. The following section will argue that based on available research, the BAS appears to be the most important RST system motivating hazardous drinking and thus by extension is likely to motivate hazardous drinking in socially anxious individuals.
The Role of Reward and Punishment Sensitivity in Understanding Social Anxiety and Alcohol use: Empirical Evidence

Whilst the theoretical underpinnings of RST in the aetiology and maintenance of SAD have been acknowledged in the literature (Kimbrel, 2008), little attention has been placed on explaining the high rates of SAD-AUDs comorbidity (Chartier, et al., 2003; Lampe, et al., 2003). To date, only one publication has investigated the role of o-RST in understanding this co-morbidity (Booth & Hasking, 2009).

In this study (Booth & Hasking, 2009), researchers utilised Carver and White’s (1994) BIS/BAS scales to measure the original conceptualisation of RST, the Liebowitz (1987) social anxiety scale to measure fear and avoidance aspects of social anxiety, and the Khavari (1978) Alcohol Test to produce an estimate of annual alcohol consumption. Four hundred and fifty-four young adults, almost half of whom were university students, completed an online questionnaire. As expected, o-BIS was positively associated with social anxiety. Specifically, a weak yet significant positive relationship was found between social avoidance and o-BIS. Further, a moderate positive relationship was found between social fears and o-BIS. Moreover, the relationship between both measured elements of social anxiety (fear and avoidance) and yearly alcohol consumption was found to be moderated by o-BAS. Results highlight the importance of investigating aversive (o-BIS) and appetitive (o-BAS) processes in understanding social anxiety.

Using r-RST, Kimbrel (2008) proposed that co-morbidity may be explained by elevated levels of r-BIS and FFFS. It was reported that the anxiolytic effects expected or experienced as a result of drinking alcohol acted to
relieve the elevated anxiety and stress associated with high levels of social anxiety, also known as the *self-medication hypothesis* (Khantzian, 1985). According to this contention, it is expected that individuals high in r-BIS (high anxiety) and FFFS (highly fearful) drink in order to reduce unwanted symptoms produced by sensitivity of these systems.

Despite Kimbrel’s (2008) proposal that FFFS and r-BIS are implicated in motivating drinking behaviour, the following section will demonstrate that the available evidence demonstrates the BAS as the primary motivational system relevant in understanding alcohol use. It will be shown that, in contrast to the model suggested by Kimbrel (2008), o-BIS and purported threat-sensitive motivational processes are inconsistently associated with drinking behaviour. That is, research drawing on o-RST has reported no consistent relationship between threat sensitivity and alcohol use (Franken, 2002; Franken & Muris, 2006; Franken, et al., 2006; Hundt, et al., 2008; Kambourooulos & Staiger, 2001;2004;2007; Zisserson & Palfai, 2007). Thus, a major contribution of the current thesis is to incorporate appetitive motivational processes demonstrated to be important in understanding alcohol use to understanding co-morbid social anxiety and hazardous drinking.

**O-BAS and Problematic Alcohol Use; Questionnaire Methodology**

A number of studies have investigated the role of o-RST in understanding alcohol use utilising various questionnaires in their methodology (e.g., Franken, 2002; Johnson, et al., 2003; Kambourooulos & Staiger, 2009; Loxton & Dawe, 2006;2007; O’Conner & Colder, 2005; Pardo, et al., 2007).
In a large epidemiological study, o-RST was used as a theoretical framework for investigating alcohol use in 1,803 individuals aged 19 to 21 years (Johnson, et al., 2003). Results found that elevated levels of the Carver and White's (1994) BAS subscale 'fun seeking' (the desire for novel rewards and spontaneous pleasure seeking) were positively related to alcohol abuse and dependence. Interestingly, while o-BAS was associated with lifetime problematic alcohol use, this relationship was not true of individuals with co-morbid mental health conditions. O-BIS was found to be unrelated to alcohol use in this study. Results are consistent with previous findings which have consistently implicated an elevated o-BAS and no involvement of the o-BIS in understanding alcohol use (Franken, 2002; Kambouroopoulos & Staiger, 2001;2004;2007; Loxton & Dawe, 2001; O'Conner & Colder, 2005; Zisserson & Palfai, 2007). In this sample Johnson et al. (2003) provide little evidence for the contention that aversive motivational processes motivate alcohol use. Rather, appetitive processes were most important in motivating alcohol use.

Another example of the relationship between o-BAS and alcohol use was demonstrated in a university sample from The Netherlands (Franken & Muris, 2006). O-RST, as measured by the BIS/BAS scales (Carver & White, 1994) was investigated in a non-clinical sample of 276 students (Franken & Muris, 2006). Results significant positive relationships between o-BAS 'fun seeking' and both alcohol use quantity and binge drinking frequency (Quantity, Frequency, Variability Index; Lemmens, Tan, & Knibbe, 1992) were reported. There were also small but significant negative correlations between o-BIS and both alcohol quantity and binge drinking in the community sample.
The role of heightened o-BAS in understanding alcohol use was also investigated in a study of first year American college students (O’Conner & Colder, 2005). Using a series of questions, researchers assessed alcohol quantity, frequency and number of problems associated with alcohol use in addition to administering a self report measure of o-RST (SPSPQ; Torrubia, et al., 2001). Results indicated that there were weak yet significant positive associations between o-BAS and alcohol quantity and problematic consequences of alcohol use. Frequency of alcohol use was not a correlate of o-BAS. Further, o-BIS was not a correlate of alcohol use in this sample. Similar findings were found in a Spanish undergraduate sample, in which an equivalent methodology was used (Pardo, et al., 2007). Pardo et al. assessed frequency, quantity and age of onset of alcohol use using a series of questions. Correlational analysis found a weak positive relationship between o-BAS and alcohol frequency and quantity and a significant negative correlation with age of onset (Pardo, et al., 2007). However, a significant negative relationship between o-BIS and frequency and quantity was also reported. Both of these studies (O’Conner & Colder, 2005; Pardo, et al., 2007) demonstrated a significant methodological limitation due to the use of a non standardised alcohol measure; despite this, results were congruent with other studies which have demonstrated the link between appetitive motivation and alcohol use using appropriate standardised measures (e.g., Franken & Muris, 2006; Hundt, et al., 2008; Johnson, et al., 2003).

Hundt et al. (2008) conducted a very similar study to Pardo et al. (2007), however addressed the methodological issue highlighted in the two prior studies (O’Conner & Colder, 2005; Pardo, et al., 2007) by using a highly validated alcohol measure the AUDIT (Saunders, Aasland, Babor, De La Fuente, & Grant,
1993) to measure drinking behaviour in undergraduates. A significant positive correlation between o-BAS (SPSRQ; Torrubia, et al., 2001) and AUDIT was reported, whilst no relationship between r-BIS and alcohol use was found.

Kimbrel et al. (2008) administered the same questionnaires to 181 undergraduates from South Carolina. Results comprised a significant positive relationship between o-BAS and alcohol use, in addition to a small but significant negative association between o-BIS and alcohol use. Results offer further support for the role of appetitive motivational processes in understanding hazardous alcohol use, as measured using a highly valid and reliable tool (Saunders, et al., 1993).

In another study, data was collated via the American State and Local Youth Risk Behaviour Survey (2007), an assessment of 1014 young people between the ages of 17-69 years (Voigt, et al., 2009). Alcohol use was measured via a series of questions which have previously been shown to have good internal consistency and test-retest reliability (Brener, et al., 2002). A moderate significant relationship was found between the o-BAS fun seeking subscale and a weak significant negative relationship between reward responsiveness (how one feels once a reward has been received) of the Carver and White (1994) BIS/BAS scales and alcohol use. O-BIS was not a correlate of alcohol use in this study.

Results were similar in a more recent study conducted within a Taiwanese sample of 2453 students (Ju-Yu, Chih-Hung, Cheng-Fang, Cheng-Sheng, & Cheng-Chung, 2009). AUDIT scores were separated in to high and low levels using a cut off of eight (Saunders, et al., 1993) and o-RST measured using the BIS/BAS scales (Carver & White, 1994). Analysis of Variance (ANOVA) procedures indicated that those high in problematic alcohol use reported higher o-BAS fun
seeking' and 'drive' (pursuit of desired goals) and lower levels of o-BIS than those with lower levels of alcohol use.

Kambouropoulos and Staiger (2007) measured aversive and appetitive behaviours during behavioural tasks and via self report data in 27 hazardous drinkers. Specifically, the Q-TASK (Newman, Wallace, Schmitt, & Arnett, 1997) was used to assess aversive motivation and the Card Arranging Reward Responsivity Objective Test (CARROT; Powell, Al-Adawi, Morgan, & Greenwood, 1996) to measure appetitive motivation. Additionally, the SPSRQ (Torrubia, et al., 2001) was administered to capture self report reward and punishment sensitivities as well as a measure of state affect (see Kambouropoulos & Staiger, 2007 for a description of this measure). Contrary to findings derived from prior research (Franken, 2002; Kambouropoulos & Staiger, 2001;2004; Zisserson & Palfai, 2007), Kambouropoulos and Staiger (2007) found no differences between controls and hazardous drinkers for behavioural measures of appetitive motivation. However, consistent with previous work (e.g., Johnson, et al., 2003; O’Connor & Colder, 2005; Pardo, et al., 2007), self report o-BAS was significantly higher in the hazardous drinkers. In addition, state negative affect was significantly higher in the hazardous drinking group. Collectively, results demonstrated the utility of aversive (state affect) and appetitive motivational processes in understanding hazardous alcohol use.

To date, there has been two studies published which have not found o-BAS or o-BIS to be associated with alcohol use (Franken, et al., 2006; Hasking, 2006). However, both of these findings may be explained by the sample utilised in these studies. In the first of these studies, Franken et al. (2006) investigated group differences in BIS/BAS between individuals in inpatient treatment for an
AUD (N=39) and compared results to controls (N=96). In this sample no significant group differences were found for o-BAS or o-BIS when individuals with AUDs were compared with controls. Results derived from this data do not support the aversive or appetitive motivational model of understanding alcohol use. However, a constraint of this research is associated with the sample utilised. Franken et al. list their AUD group as “alcoholics...recruited from two substance abuse inpatient treatment centers...” (p. 400). No further investigation into the nature of these AUDs was performed, nor was information reported regarding the participants stage of treatment. These confounding factors make it difficult to understand the sample utilised and thus draw conclusions from findings.

Certainly these findings contradict a large body of literature examining hazardous alcohol use in the community (Franken & Muris, 2006; Kambouropoulos & Staiger, 2007; Loxton & Dawe, 2001; O'Conner & Cold, 2005; Pardo, et al., 2007; Voigt, et al., 2009)

In the second of these studies (Hasking, 2006), participants comprised 347 Australian adolescent students ranging in age from 12 to 18 years of age. The mean age of respondents was 14 years of age, four years younger than the legal drinking age in Australia. Results indicated that older participants in this sample reported hazardous drinking; therefore researchers acknowledged that this non significant finding may be due to insufficient variance in alcohol use behaviour.

Four other studies have found relationships between the same variables in adolescent samples (Knyazev, 2004; Knyazev, Slobodskaya, & Kharchenko, 2004; Loxton & Dawe, 2001; Willem, Bijttebier, & Claes, 2010). Two studies investigated alcohol use independently from other substances in samples aged approximately 16-18 (Loxton & Dawe, 2001; Willem, et al., 2010). In the other
two studies (Knyazev, 2004; Knyazev, Slobodskaya, & Kharchenko, 2004), associations were made between o-RST and substance use which, in addition to alcohol use, included tobacco and other drug use. Thus, although o-RST has been associated with alcohol use in older adolescents (age 16 to 18) (Loxton & Dawe, 2001; Willem, et al., 2010), there has been little support for this relationship in younger adolescent samples (Hasking, 2006), possibly due to the small number of younger adolescents drinking at hazardous levels.

**O-BAS Sensitivity and Alcohol Cue: Experimental Studies**

Experimental research has repeatedly implicated o-BAS sensitivity with alcohol cue reactivity (i.e., responses to the sight, smell and taste of alcohol) (Franken, 2002; Kambourooulos & Staiger, 2001; 2004; Zisserson & Palfai, 2007). Such findings highlight the role of heightened o-BAS sensitivity in motivating the urge to drink alcohol.

For example, Kambourooulos and Staiger (2001) investigated the role of o-BAS in mediating responsiveness to alcohol related cues. Participants (20 heavy drinkers, 18 light drinkers) completed a Card Arranging Reward Responsivity Objective Test (CARROT; Powell, et al., 1996), designed to assess the speed of performance on a task when a financial reward is provided. Measures of o-RST were also completed (BIS/BAS scales; Carver & White, 1994) and alcohol use was measured using a short version of an alcohol use questionnaire (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). Urge to drink was assessed via a number of related questions self rated on an 11 point Likert scale, a technique accepted by and used in a number of studies (e.g., Payne, et al., 1992; Stasiewicz, et al., 1997). Results indicated that after exposure to alcohol heavy alcohol drinkers reported a significant increase in responsivity to
rewards, as measured by the CARROT task. Furthermore, in the heavy drinking 
group o-BAS was significantly correlated with an urge to drink and positive affect 
(PANAS; Watson, et al., 1988). Results highlight the importance of appetitive 
motivation in understanding the desire to drink alcohol.

Franken (2002) also utilised a cue reactivity paradigm in a sample of 
heavy or highly regular drinkers. In this study participants were presented with 
images of alcohol related stimuli prior to completing the _Desire for Alcohol 
Questionnaire_ (Love, James, & Willner, 1988). Participants found to be highly 
reward sensitive (BAS-drive; Carver & White, 1994) were more likely to report 
strong urges and intentions to consume alcohol and report drinking due to 
expected relief from a negative affective states after exposure to alcohol related 
cues. The o-BIS was found to have no effect upon participant's intent to drink 
alcohol.

Kambouropoulos and Staiger (2004) assessed regular social drinkers who 
reported recurrent binge drinking. In this study, participants were randomly 
assigned to either a _Drink_ or _No Drink_ condition and exposed to a neutral cue, 
a glass of water, prior to exposure to their favourite alcoholic drink. Interestingly, 
when presented with the alcohol consumption condition, participants reported an 
increase in positive affect and a positive urge to drink alcohol when compared 
with baseline and the participants presented with the neutral cue. Also reported 
was a significant positive relationship between self reported sensitivity to reward 
(SPSRQ; Torrubia, Avila, Molto, & Caseras, 2001) and the urge to drink alcohol. 
Not surprisingly, self report measures of trait anxiety from the STAI (Spielberger, 
et al., 1983) and o-BIS were not related to appetitive motivational responses. 
Similarly, Kambouropoulos and Staiger (2009) used the same cue reactivity
protocol utilised in the aforementioned study to investigate appetitive behaviour in response to alcohol related stimuli. Results derived from the data provided by 61 regular social drinkers indicated that o-BAS, as measured by the SPSRQ (Torrubia, et al., 2001) was a significant predictor of the urge to drink alcohol (AUDIT; Saunders, et al., 1993). O-BIS was not investigated in this study. Results offer strong support for the role of o-BAS in motivating alcohol use.

In another study of 'hazardous drinkers' (Zisserson & Palfai, 2007), defined as having score of eight or greater on the Alcohol Use Disorders Identification Test (AUDIT; Saunders, et al., 1993), results demonstrated that individuals high in o-BAS reported stronger urges to drink prior to and after alcohol exposure cues. Further, after controlling for gender, o-BAS scores (Carver & White, 1994) were significantly correlated with baseline and pre-cue self-reports of the urge to drink alcohol, self-reported arousal, and pleasantness. Congruent to previous studies (Franken, 2002) there were no significant associations between these variables and o-BIS.

Summary

In summary, research employing non experimental (e.g., Johnson, et al., 2003; O'Connor & Colder, 2005; Pardo, et al., 2007) and experimental designs (e.g., Franken, 2002; Kambouropoulos & Staiger, 2001; 2009; Zisserson & Palfai, 2007) has invariably found the o-BAS/reward sensitivity to be associated with drinking behaviour. While some studies have found small negative relationships between the o-BIS and drinking (Franken & Muris, 2006; Hundt, et al., 2008; Juyu, et al., 2009; Pardo, et al., 2007), others have found no such relationship (Hundt, et al., 2008; Johnson, et al., 2003; O'Connor & Colder, 2005; Voigt, et al., 2009).
This suggests that in light of the revisions to RST (Gray & McNaughton, 2000), whereby the FFFS has replaced the role of the o-BIS as the punishment system, there may be a small negative relationship between alcohol use and the FFFS. Nonetheless, negative relationships between punishment sensitivity and alcohol use are inconsistent with the self-medication hypothesis. Kimbrel (2008) suggested the FFFS and r-BIS to be the main drivers of alcohol use in individuals with SAD. If highly anxious individuals were drinking in order to reduce their anxiety symptoms it would be expected that heavy drinkers would have elevated scores on current measures of o-BIS; however, this is not apparent in any of the samples studied (Franken, 2002; Franken & Muris, 2006; Hundt, et al., 2008; Johnson, et al., 2003; Ju-Yu, et al., 2009; Kambouropoulos & Staiger, 2001; 2004; Knyazev, 2004; Knyazev, Slobodskaya, & Kharchenko, 2004; Loxton & Dawe, 2001; O'Conner & Colder, 2005; Pardo, et al., 2007; Voigt, et al., 2009; Zisserson & Palfai, 2007). It seems that while reward sensitivity plays an important role in the consumption of alcohol, sensitivity to punishment appears to play a small but secondary role in motivating drinking behaviour. Whilst it is possible that there is utility to Kimbrel's model and the FFFS and r-BIS play a role in understanding the SAD/AUD co-morbidity specifically, the inclusion of BAS processes would serve to improve our understanding of the relationship between social anxiety and hazardous alcohol use. This thesis will offer a novel understanding of both aversive and appetitive processes in understanding social anxiety and hazardous alcohol use.

Constraints of Past Research and Aims of the Current Thesis

As has been demonstrated, a small number of empirical studies have specifically investigated the role of motivational processes in understanding social
anxiety (Coplan, et al., 2006; Kashdan & Roberts, 2006; Kimbrel, et al., 2008) and of these only one has considered co-morbid alcohol use (Booth & Hasking, 2009). This is despite an abundance of literature regarding other aetiological and maintaining factors for heightened social anxiety (e.g., Elizabeth, et al., 2006; Nelson, 2000; Schwartz, 1999; Wittchen, et al., 1999) and problematic alcohol use (e.g., Barnes & Welte, 1986; Cloninger, et al., 1985; Kendler, et al., 2008).

Thus, there is a body of literature with substantial limitations in understanding the processes that may facilitate the development of social anxiety and co-morbid hazardous drinking. The preceding chapters have argued that an examination of motivational processes (i.e. aversive and appetitive motivation) using r-RST as a theoretical framework may offer an avenue to better understand the co-morbidity between social anxiety in and alcohol use in a community population.

Thus, there are two primary aims of this thesis:

1. To investigate motivational processes involved in understanding social anxiety and alcohol use by utilising r-RST.

2. To obtain a greater understanding of defensive behaviour and threat perception in understanding the relationship between r-RST, social anxiety, and alcohol use.

Two studies are reported to investigate these aims. Using self report methodology, study one will investigate the revised RST in understanding elevated levels of social anxiety and hazardous alcohol use in a large Australian community sample. Further, this study aims to investigate the role of trait fearfulness and anxiety to determine the independence of these emotions, in line with revisions to RST, in understanding social anxiety. Despite the applicability
of r-RST in understanding social anxiety and co-morbid hazardous alcohol use, no studies to date have drawn on r-RST to explore this relationship.

Study two will expand upon findings from study one by investigating defensive behaviour and threat perception in understanding social anxiety and alcohol use in a community sample. Using threatening scenarios (Blanchard, Hynd, et al., 2001), this study provided an avenue to examine motivational processes involved in understanding social anxiety and alcohol use as well as the involvement of environmental variables such as threat perception (e.g., ambiguity, availability for concealment) in understanding appetitive and aversive orientation.

The following chapter will address the first of these aims by investigating r-RST in a community population.
Chapter Four: Study One - Investigating R-RST in Understanding Social Anxiety and Alcohol Use in a Community Sample

Deficits in the Co-morbid Social Anxiety and Alcohol Use Literature and the Contribution of Present Research

As has been discussed, the following areas of interest have not been addressed by previous literature. Current models explaining the co-morbidity between elevated social anxiety and problematic alcohol use largely focus upon the negative reinforcement hypothesis of alcohol use, whereby alcohol is consumed in order to reduce anxiety symptomatology. As discussed, these models fail to consider the role of appetitive processes, which have repeatedly been shown to be implicated in alcohol consumption (Franken, 2002; Franken & Muris, 2006; Hundt et al., 2008; Johnson et al., 2003; Kambouropoulos & Staiger, 2001, 2004; Loxton & Dawe, 2001; O’Conner & Colder, 2005; Pardo et al., 2007; Zisserson and Palfai, 2007).

Moreover, such models do not take into consideration individual differences which may assist in better understanding why some socially anxious individuals turn to alcohol, whilst others do not (e.g., Chartier, et al., 2003; Lampe, et al., 2003). Consequently, r-RST is suggested to be an appropriate theoretical model to investigate co-morbid social anxiety and alcohol use, to address these two issues, as it is a model of individual differences in aversive and appetitive motivation (Gray & McNaughton, 2000).

In addition, no empirical studies have investigated revised r-RST in relation to social anxiety or alcohol use. Kimbrel (2008) offered a theoretical account for explaining the role of the revised RST in understanding SAD,
however this model is yet to be empirically tested. Kimbrel drew on research utilising Gray’s (1982) original RST which supported the role of the o-BIS in understanding social anxiety (Coplan, et al., 2006; Kashdan & Roberts, 2006; Kimbrel, et al., 2008); expanding on such research by proposing the involvement of the FFFS.

Additionally, the current study will investigate the role of r-RST in understanding the development of problematic alcohol use. Kimbrel (2008) proposed that FFFS and r-BIS sensitivities were important in understanding co-morbid social anxiety and alcohol use; however this is incongruent with clear evidence that, across a variety of clinical and community samples, the BIS appears to be less relevant to our understanding of alcohol use than the BAS, which has repeatedly been implicated in the appetitive motivation to drink alcohol (Franken, 2002; Franken & Muris, 2006; Huntil, et al., 2008; Johnson, et al., 2003; Kambouropoulos & Staiger, 2001;2004; Loxton & Dawe, 2001; O’Conner & Colder, 2005; Pardo, et al., 2007; Zisserson & Palfai, 2007).

Given this evidence, it is suggested that the factor that might distinguish those with social anxiety only, from those with co-morbid problematic alcohol use is elevated BAS sensitivity. That is, those socially anxious individuals who are motivated to drink alcohol do so to reduce anxiety in addition to being particularly responsive to the specific rewarding properties (e.g., neurobiological reward, positive affect) of drinking alcohol (Robinson & Berridge, 2001; Wise, 1998; Wise & Bozarth, 1987). Given this propensity to approach rewarding stimuli, there may be a subgroup of individuals with social anxiety who, in addition to being sensitive to threatening and fearful stimuli such as those that
may occur in social situations, are also sensitive to the rewarding aspects of alcohol use.

Further, understanding of the role of fear and anxiety in socially anxious individuals remains to be investigated. The revised RST clearly delineates between the emotions fear and anxiety (Gray & McNaughton, 2000). A notion which has been supported by psychometric and behavioural studies (Cooper, et al., 2007; Perkins, et al., 2007). Understanding how the FFFS and r-BIS interact in individuals with heightened social anxiety can assist in better understanding predisposing factors underpinning the development and maintenance of this disorder.

Research Aims

The current study aims to address the aforementioned issues by applying r-RST (Gray & McNaughton, 2000) in understanding co-morbid social anxiety and problematic alcohol use in a large Australian community population. Study one will be a large community investigation which will be the first study to provide an understanding of how FFFS, fear, BIS, anxiety and reward sensitivity interact in people with heightened social anxiety and elevated levels of alcohol use and abuse in the general population. By studying this sample, we aim to obtain a clearer understanding of motivational processes and how they relate to subclinical levels of social anxiety and alcohol problems. A secondary aim of this study is to investigate the role of fear and anxiety in to determine how separable these emotions are in this sample, particularly those with heightened social anxiety.
Hypotheses

Based on the research previously discussed, it is hypothesised that:

1) Levels of FFFS (Fight, Flight, and Freeze) and r-BIS (Jackson 5 Scale; Jackson, 2009; Torrubia, et al., 2001) will significantly and positively predict social anxiety (SIAS/SPS; Mattick & Clarke, 1998);

2) BAS (revised and original; Jackson, 2009; Torrubia, et al., 2001) scores will significantly and positively predict alcohol use (AUDIT; Saunders, et al., 1993);

3) Individuals with high social anxiety and alcohol use will report significantly higher levels of FFFS (Fight, Flight, and Freeze)/fear (FSS; Wolpe & Lang, 1964), r-BIS/anxiety (STAI; Spielberger, et al., 1983), and BAS compared to individuals with lower levels of both social anxiety and alcohol use;

4) Individuals with elevated social anxiety and alcohol use are expected to have higher levels of reward sensitivity (BAS) when compared to those high on social anxiety only;

5) Fear and anxiety are expected to independently predict social anxiety;

Method

Participants

Participants comprised 547 individuals recruited via an online questionnaire; 195 males (35.6%, age; $M = 30.34, SD = 10.12$) and 349 females (63.8%, age; $M = 29.69, SD = 10.19$). Three participants did not identify their gender. As can be seen in Table 4.1, the sample largely comprised Australian born participants who work at a full time or part time/casual capacity, and are married/living with a partner or are single. Only 20% of the sample listed their
primary role as a student. The mean age of this sample was 33 years (SD= 11.25), ranging from 18 – 74 years.
Table 4.1

Participant Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Unemployed</td>
<td>13 (6.7%)</td>
<td>16 (4.6%)</td>
<td>29 (5.3%)</td>
</tr>
<tr>
<td>Employed casually/PT</td>
<td>36 (18.4%)</td>
<td>89 (25.5%)</td>
<td>125 (22.9%)</td>
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<tr>
<td>Employed FT</td>
<td>112 (57.4%)</td>
<td>134 (38.4%)</td>
<td>247 (45.2%)</td>
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<tr>
<td>Self employed</td>
<td>4 (2%)</td>
<td>8 (2.4%)</td>
<td>12 (2.4%)</td>
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<tr>
<td>Student a</td>
<td>22 (11.3%)</td>
<td>84 (24.2%)</td>
<td>107 (19.7%)</td>
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<tr>
<td>Pensioner/retiree/semi-retired</td>
<td>6 (3%)</td>
<td>4 (1.1%)</td>
<td>10 (1.9%)</td>
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<tr>
<td>Stay at home parent</td>
<td>1 (.5%)</td>
<td>13 (4.2%)</td>
<td>14 (3%)</td>
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<tr>
<td>Other</td>
<td>1 (.5%)</td>
<td>3 (.9%)</td>
<td>4 (.8%)</td>
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<tr>
<td>Relationship status</td>
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<td></td>
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<tr>
<td>Single</td>
<td>66 (33.8%)</td>
<td>102 (29.2%)</td>
<td>169 (30.9%)</td>
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<tr>
<td>Casual partner</td>
<td>7 (3.6%)</td>
<td>11 (3.2%)</td>
<td>18 (3.3%)</td>
</tr>
<tr>
<td>Steady partner</td>
<td>46 (23.6%)</td>
<td>68 (19.5%)</td>
<td>114 (20.8%)</td>
</tr>
<tr>
<td>Married/living with a partner</td>
<td>69 (35.4%)</td>
<td>159 (45.6%)</td>
<td>229 (41.9%)</td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>6 (3.1%)</td>
<td>7 (2%)</td>
<td>13 (2.4%)</td>
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<td>Widowedor</td>
<td>1 (.5%)</td>
<td>2 (.6%)</td>
<td>3 (.5%)</td>
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<tr>
<td>Country of birth</td>
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<tr>
<td>Australia</td>
<td>163 (83.5%)</td>
<td>298 (85.5%)</td>
<td>463 (85%)</td>
</tr>
</tbody>
</table>
Table 4.1 (cont)

**Participant Demographics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>England/UK</td>
<td>13 (6.7%)</td>
<td>21 (6.1%)</td>
</tr>
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<td>New Zealand</td>
<td>4 (2%)</td>
<td>8 (3.3%)</td>
</tr>
<tr>
<td>South Africa</td>
<td>3 (1.5%)</td>
<td>3 (.9%)</td>
</tr>
<tr>
<td>Canada</td>
<td>2 (1%)</td>
<td>1 (.3%)</td>
</tr>
<tr>
<td>India</td>
<td>3 (1.5%)</td>
<td>-</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2 (1%)</td>
<td>1 (.3%)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (2%)</td>
<td>17 (5.1%)</td>
</tr>
</tbody>
</table>

*Note.* PT= part time, FT= full time. a Includes students with p/t or casual work. b Total is inclusive of individuals who did not provide gender information.

**Measures**

**Social anxiety – Social Interaction Anxiety Scale (SIAS) and the Social Phobia Scale (SPS) (Mattick & Clarke, 1998).** The SIAS is a 19 item measure of social interaction anxiety and the SPS a 20 item measure of fear related to scrutiny by others. These scales are typically administered together and utilised as a holistic measure of social anxiety; however are also validated to be administered as individual measures. Items are scored on a five point Likert scale ranging from zero (not at all characteristic or true of me”) to four (extremely characteristic or true of me”); two items are reverse scored. Examples of SIAS items include “am tense mixing in a group” and “When mixing socially I am uncomfortable”. Examples of SPS items include “fear I may blush when I am with others” and “can feel conspicuous standing in a queue”. The SPS and SIAS has been demonstrated to have strong internal consistency in community, clinical, and undergraduate samples (SPS, α=0.89-0.94; SIAS, α=0.88-0.93) and have good
test-retest reliability (SPS $r=0.93$, SIAS $r=0.92$ at 13 weeks). Both measures have been found to discriminate among individuals with anxiety disorders and between those with social anxiety and controls (Mattick & Clarke, 1998; Mattick, Peters, & Clarke, 1989).

**Alcohol Use – The Alcohol Use Disorders Identification Test (AUDIT; Saunders, et al., 1993).** The AUDIT is a widely used measure of alcohol use which assesses the frequency and quantity of alcohol consumption (e.g., how often do you have a drink containing alcohol?), alcohol related problems (e.g., have you or someone else been injured as a result of your drinking?), dependence symptoms (e.g., how often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?) and binge drinking episodes (e.g., how often do you have six or more drinks on one occasion?). It has very good internal consistency ($\alpha=0.80$-$0.94$) and test-retest reliability ($r=0.88$ over six weeks). Scores on this 10 item measure can range from 0-40 with a score equal to or over eight indicative of potentially hazardous drinking.

**Revised RST - Jackson 5: Scales for measuring the Revised Reinforcement Sensitivity Theory (Jackson, 2009).** The newly developed Jackson 5 measure was designed specifically to quantify levels of r-RST constructs. It comprises three higher order scales subscales (r-BIS, r-BAS, and FFFS) and the FFFS primary scales (r-Fight, r-Flight, and r-Freeze). The Jackson 5 contains 30 statements, six items to reflect each subsystem; for example, r-BIS (e.g., I want to avoid looking bad”), r-BAS (e.g., I look for new sensations”), r-Fight (e.g., I would fight back if someone hit me first”), r-Flight (e.g., If a dog barks at me, I would run away”), and r-Freeze (e.g., If I got scared in my bed at
night, I would remain motionless”). It has adequate internal consistency ($\alpha=0.70$-$0.83$) and has demonstrated appropriate convergent and discriminant validity with commonly utilised personality measures such as the Eysenck’s Personality Questionnaire (Eysenck & Eysenck, 1991), Dickman’s impulsivity constructs (Dickman, 1990), and Costa and McCrae’s Neuroticism Extraversion Openness questionnaire (Costa & McCrae, 1992).

**Trait anxiety - State Trait Anxiety Inventory (STAI) Form Y-2** (Spielberger, et al., 1983). Trait anxiety was measured using trait subscale of the STAI. This measure was used to assess the tendency to experience anxiety in adverse situations (Spielberger, et al., 1983). This measure comprises 20 statements and requires participants to reflect upon how they “generally feel” on a scale from one (“almost never”) to four (“almost always”). Items include “feel secure”, “feel pleasant” (reverse coded), and “feel inadequate”. The STAI-T has excellent internal reliability ($\alpha=0.86-0.92$) and has been shown to have good test-retest reliability over 104 days ($r=0.77$).

**Fear - Fear Survey Schedule III (FSS) (Wolpe & Lang, 1977).** The FSS is considered the most established valid and reliable measure of fear (Oei, Cavallo, & Evans, 1987) with reports of Cronbach alphas ranging up to 0.97 (Perkins, et al., 2007). A number of versions of this scale have been developed (e.g., Wolpe & Lang, 1964;1977) ranging in length from 8-108 items. The present study used the most recent version of the FSS (Wolpe & Lang, 1977), comprising 108 items of potentially aversive stimuli such as “thunder” and “loud voices”. Participants were asked to reflect on how “disturbed” they felt by the items on a five point scale from zero (“not at all”) to four (“very much”).
In accordance with Klieger and McCoy's (1994) recommendations for improving the concurrent validity of the FSS, an example item was provided containing explicit descriptions for each of the ratings. For example, the item "harmless snakes" was provided following the questionnaire instructions with a list of the behavioural indicators representative of each rating including zero - I may feel disgusted but I am not at all nervous or fearful when I see a harmless snake at the zoo" and four - I feel very afraid, I run away, pass out when I see a harmless snake at the zoo." Such descriptors use the example ratings to highlight that responses must be indicative of fear to leverage a rating for an item rather than other emotional responses such as disgust. Research has demonstrated that this technique reduces the number of false positives endorsed thus given a purer measure of fear (Klieger & McCoy, 1994).

Some items of this measure have been criticised for their use with the general public as they may be deemed as embarrassing or inappropriate (see Cooper, et al., 2007; Perkins, et al., 2007); subsequently, six items of this nature (people who seem insane", ugly people", crippled or deformed people", becoming sexually aroused", ideas of possible homosexuality", and masturbation") were excluded from use in the present study. One hundred and two of the original items were retained.

**Original RST - Sensitivity to Punishment and Sensitivity to Reward Scale (SPSRQ) (Torrubia, et al., 2001).** The SPSRQ was designed to specifically assess appetitive (o-BAS) and aversive (o-BIS) motivational system functioning as specified by the original conceptualisation of RST. A short version of the SPSRQ has been developed which demonstrated improved factor structure and item properties when compared to the original 48 item measure (O'Connor,
Colder, & Hawk, 2004). This questionnaire comprises 35 yes/no items, 18 of which measure sensitivity to punishment (SP), and 17 dedicated to measure sensitivity to rewarding (SR) stimuli. Endorsed items were assigned a value of one whilst non-endorsed items were allocated a score of zero. Both scales demonstrate acceptable levels of internal consistency (SP, $\alpha=0.84 - 0.85$; SR, $\alpha=0.70-0.82$) and test-retest reliability (three months; SP, $r=0.89$; SR, $r=0.87$) (Cooper & Gomez, 2008; Ibáñez, et al., 2010; O’Conner, et al., 2004). These two scales theoretically capture these constructs as evidenced by appropriate associations with other motivational traits such as extraversion, neuroticism, anxiety and sensation-seeking (see Cooper & Gomez, 2008; Torrubia, et al., 2001).

Procedure

This study employed a quantitative design that included the completion of an online questionnaire by a large Australian community sample (see Appendix D). The questionnaire took approximately 15-20 minutes to complete and was preceded by a plain language statement which clearly outlined the purpose of the study, anonymity of responses, and any risks or potential benefits of participation. It was distributed via a number of online platforms such as university webpages, Australian advertising forums, social networking sites, and through the snowballing technique.

Results

Preliminary Data Analysis

Preliminary data analyses were conducted on all measures. Missing values analysis was conducted and any cases with more than 5% missing data
were deleted and any other data missing at random were replaced with the series mean (Tabachnick & Fidell, 2007).

Variables were examined for univariate and multivariate outliers and for deviations from normality. In accordance with Tabachnick and Fidell (2007) extreme cases, those with standardised scores exceeding 3.29, were likely to be univariate outliers. Items that were above this criterion found in the AUDIT, SIAS, SPS, r-BAS, r-BIS, Fight, FSS, and social anxiety (total) were re-coded to change the score of the variable for the outlying cases by assigning them a score that is one unit higher or smaller than the next most extreme score that is within 3.29 standard deviations (Pallant, 2007; Tabachnick & Fidell, 2007). This ensures that outliers in these cases remain true to the distribution and remain deviant, but have less impact (Tabachnick & Fidell, 2007). Using the $p<.001$ criterion (Tabachnick & Fidell, 2007) Mahalanobis distance initially identified 12 multivariate outliers which were higher than the critical value ($\chi^2 = 34.528$, $df=13$) when all totals were included in the analysis; these were consequently deleted.

Inspection of Shapiro Wilks statistics indicate that all variables with the exception of the FFSS total variable were skewed at the $p<.001$ criterion (see Table 4.2). Tabachnick and Fidell (2007) indicate that skewness and kurtosis statistics are overly sensitive with larger samples and recommend thorough investigation of normality plots. Plots suggest that the AUDIT, SIAS, SPS, and FSS were positively skewed. Since there were no serious violations noted by absolute skewness and kurtosis statistics it was decided that no transformations would be applied. This decision was based on recommendations from Tabachnick and Fidell who report that transformation of theoretically important
variables can lead to difficulty with the interpretation of data. In sum, all variables utilised in the following analyses have distributions indicative of the general population and contain no outliers ($p<.001$).

Table 4.2

*Skewness and Kurtosis Indices for all Measures*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Skewness ($SE=.11$)</th>
<th>Kurtosis ($SE=.21$)</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
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<td>SIAS</td>
<td>.97</td>
<td>.39</td>
</tr>
<tr>
<td>SPS</td>
<td>1.54</td>
<td>2.08</td>
</tr>
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<td>1.19</td>
<td>.87</td>
</tr>
<tr>
<td>R-BAS</td>
<td>-.22</td>
<td>-.23</td>
</tr>
<tr>
<td>R-BIS</td>
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<td>.46</td>
</tr>
<tr>
<td>Fight</td>
<td>.38</td>
<td>.42</td>
</tr>
<tr>
<td>Flight</td>
<td>.23</td>
<td>-.12</td>
</tr>
<tr>
<td>Freeze</td>
<td>.07</td>
<td>-.38</td>
</tr>
<tr>
<td>FFFS</td>
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<td>-.09</td>
</tr>
<tr>
<td>STAI</td>
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<td>-.44</td>
</tr>
<tr>
<td>FSS</td>
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<td>.13</td>
</tr>
<tr>
<td>O-BAS</td>
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<td>-.51</td>
</tr>
<tr>
<td>O-BIS</td>
<td>-.20</td>
<td>-.97</td>
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</table>

*Note. N=547*

**Summary Statistics**

Means, standard deviations and internal consistency data for the variables are presented in Table 4.3. As shown, with the exception of the FFFS and r-BIS scales, all measures have acceptable to very high internal consistency. Alpha
levels for the FFFS and r-BIS scales were slightly lower than those reported by Jackson (2009) which ranged from $\alpha=0.69-0.74$.

Table 4.3

*Descriptive Statistics and Reliability Coefficients for Personality Questionnaires*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Min/Max</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
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<td>9.42</td>
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<tr>
<td>SIAS</td>
<td>19.30</td>
<td>13.45</td>
<td>0-66</td>
<td>.94</td>
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<tr>
<td>SPS</td>
<td>11.42</td>
<td>11.16</td>
<td>0-57</td>
<td>.93</td>
</tr>
<tr>
<td>SA total</td>
<td>30.72</td>
<td>23.19</td>
<td>0-113</td>
<td>.96</td>
</tr>
<tr>
<td>R-BAS</td>
<td>22.05</td>
<td>3.68</td>
<td>11-30</td>
<td>.78</td>
</tr>
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<td>R-BIS</td>
<td>21.61</td>
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<td>.64</td>
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<td>Freeze</td>
<td>16.89</td>
<td>3.91</td>
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<td>O-BIS</td>
<td>9.82</td>
<td>4.71</td>
<td>0-18</td>
<td>.87</td>
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</tbody>
</table>

*Note.* SA total= Social anxiety total reflects combined SIAS and SPS scores.

**Interrelationships**

Bivariate correlational analysis was conducted to investigate the relationships among the variables. As illustrated in Table 4.4, several significant relationships were observed. Specifically, BAS (r-BAS and o-BAS) was found to be significantly correlated with the AUDIT. Moreover, fear, anxiety, FFFS and o-BIS were strongly and positively related to social anxiety. Interestingly, r-BIS
was not significantly correlated with social anxiety. Finally, fear and anxiety were found to be moderately correlated ($r=0.52, p<0.001$).
Table 4.4

*Intercorrelations Among Personality Measures*

<table>
<thead>
<tr>
<th>Variable</th>
<th>AUDIT</th>
<th>SIAS</th>
<th>SPS</th>
<th>SA tot</th>
<th>R-BAS</th>
<th>R-BIS</th>
<th>Fight</th>
<th>Flight</th>
<th>Freeze</th>
<th>FFFS</th>
<th>STAI</th>
<th>FSS</th>
<th>O-BAS</th>
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</tr>
<tr>
<td>SPS</td>
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<td>.78***</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>SA Total</td>
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<td>.95***</td>
<td>.93***</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>.12**</td>
<td>-.42***</td>
<td>-.29***</td>
<td>-.38***</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>R-BIS</td>
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<td>.04</td>
<td>.08</td>
<td>.06</td>
<td>.22***</td>
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<td></td>
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<tr>
<td>Fight</td>
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<td>-.01</td>
<td>-.04</td>
<td>.19***</td>
<td>.21***</td>
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<td></td>
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<tr>
<td>Flight</td>
<td>-.10*</td>
<td>.24***</td>
<td>.28***</td>
<td>.28***</td>
<td>-.16***</td>
<td>.08*</td>
<td>-.04</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Freeze</td>
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<td>.54***</td>
<td>.61***</td>
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<td>.05</td>
<td>-.13**</td>
<td>.45***</td>
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<td>.43***</td>
<td>.45***</td>
<td>-.14**</td>
<td>.19***</td>
<td>.47***</td>
<td>.72***</td>
<td>.70***</td>
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<td>STAI</td>
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<td>.68**</td>
<td>.65***</td>
<td>.71***</td>
<td>.33***</td>
<td>.12**</td>
<td>.09*</td>
<td>.27***</td>
<td>.53***</td>
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</tr>
<tr>
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<td>.52**</td>
<td>.60***</td>
<td>.59***</td>
<td>-.25***</td>
<td>.13**</td>
<td>-.07</td>
<td>.47***</td>
<td>.49***</td>
<td>.46***</td>
<td>.52***</td>
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<td></td>
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<td>-.02</td>
<td>.33***</td>
<td>.53***</td>
<td>.40***</td>
<td>.04</td>
<td>.01</td>
<td>.25***</td>
<td>.12**</td>
<td>.01</td>
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<tr>
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<td>.05</td>
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<td>.69***</td>
<td>.78***</td>
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<td>.10*</td>
<td>-.04</td>
<td>.41***</td>
<td>.63***</td>
<td>.53***</td>
<td>.69***</td>
<td>-.61***</td>
<td>.04</td>
</tr>
</tbody>
</table>

*Note. *p<.05, **p<.01, ***p<.001.*
R-RST and Social Anxiety

Standard multiple regression analyses were conducted to test the hypothesis that FFFS and r-BIS predicts social anxiety. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. Overall, the model explained 20.3% of the variance in social anxiety ($F(2, 544)=69.13, p<.001$). Specifically, FFFS was found to be a significant predictor of social anxiety ($t(2, 544)=11.65, p<.001$), explaining 19.98% unique variance. As can be seen in Table 4.5, r-BIS did not contribute a significant amount of variance in predicting social anxiety ($t(2, 544)=-.60, p=.550$).

Table 4.5

*Standard Multiple Regression Analyses of R-BIS and FFFS on Social Anxiety*

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>$\beta$</th>
<th>t</th>
<th>p</th>
<th>Zero-</th>
<th>$sr^2$</th>
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<td></td>
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<td>.000</td>
<td>.45</td>
<td>.20</td>
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<tr>
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<td>-.02</td>
<td>-.60</td>
<td>.550</td>
<td>.06</td>
<td>.00</td>
</tr>
</tbody>
</table>

Further analyses were undertaken to obtain a clearer understanding of the role of FFFS in predicting social anxiety. To do this, the Fight, Flight, and Freeze subscales were entered separately into the analyses to examine their individual relationships with social anxiety. Overall, this model explained 37.1% of the variance in social anxiety ($F(3, 543)=106.98, p<.001$). As can be seen in Table 4.6, Freeze was the only variable which significantly predicted social anxiety accounting for 29.48% of the unique variance ($t(3,543)=15.97, p<.001$).
Table 4.6

*Standard Multiple Regression Analyses of Fight, Flight, and Freeze on Social Anxiety*

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>Zero-order</th>
<th>sr²</th>
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<td>.969</td>
<td>.07</td>
<td>.00</td>
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<td>.61</td>
<td>15.97</td>
<td>.000</td>
<td>.61</td>
<td>.29</td>
</tr>
</tbody>
</table>

Standard multiple regression analyses were also run to investigate the relationship between Fight, Flight, and Freeze and the two categories of social anxiety, social interaction and social performance. Results for these analyses can be seen in Table 4.7. Overall, Fight, Flight and Freeze accounted for 36.30% of the variance in social interaction anxiety ($F(3,543)=102.94, p<.001$) and 29.7% of the variance in social performance anxiety ($F(3,543)=76.30, p<.001$). Results indicated that Freeze was the only significant variable to predict both social performance ($t(3,543)=15.97, p<.001$) and social interaction anxiety ($t(3,543)=16.06, p<.001$).
### Table 4.7

**Standard Multiple Regression Analyses of Fight, Flight, and Freeze on Social Interaction Anxiety and Social Performance Anxiety**

<table>
<thead>
<tr>
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<th>B</th>
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<th>t</th>
<th>p</th>
<th>sr²</th>
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<td>.22</td>
</tr>
</tbody>
</table>

A standard multiple regression analysis was performed to determine whether o-BIS and FFFS predicted social anxiety (total). Overall, the model explained 60.9% of the variance in social anxiety ($F(2, 544) = 424.43, p < .001$). Specifically, o-BIS was found to be a significant predictor of social anxiety ($r(2, 544) = 21.88, p < .001$), explaining 41% of the unique variance. As can be seen in Table 4.8 FFFS did not contribute a significant amount of variance in predicting social anxiety when included in the model with o-BIS ($r(2, 544) = 1.69, p = .092$). This indicates that o-BIS is a stronger correlate of social anxiety than FFFS (o-BIS; $r = .78, p = .000$, FFFS; $r = .45, p = .000$).
Table 4.8

Standard Multiple Regression Analyses of O-BIS and FFFS on Social Anxiety

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>Zero-order pr²</th>
<th>sr²</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFFS</td>
<td>.17</td>
<td>.10</td>
<td>.05</td>
<td>1.69</td>
<td>.092</td>
<td>.45</td>
<td>.01</td>
</tr>
<tr>
<td>O- BIS</td>
<td>3.70</td>
<td>.16</td>
<td>.75</td>
<td>23.82</td>
<td>.000</td>
<td>.78</td>
<td>.51</td>
</tr>
</tbody>
</table>

BAS and Alcohol Use

A linear regression was performed test the hypothesis that BAS would positively predict alcohol use. O-BAS and r-BAS were tested individually, which was particularly important as there was only a weak correlation between these constructs ($r=.33, p=.000$). Overall, r-BAS was found to explain 1.4% of the variance in alcohol use ($F(1,545)=7.62, p=.006$) and o-BAS 6.9% of variance in alcohol use ($F(1,545)=34.08, p<.001$). Results indicate that both the revised ($t(1,545)=2.76, \beta=.12, sr²=.01, p=.006$) and original, ($t(1,545)=5.84, \beta=.26, sr²=.07, p<.001$) measures of BAS are significant predictors of alcohol use.

Differences in FFFS, fear, r-BIS, Anxiety, and BAS, in Participants with High Versus Low Levels of Social Anxiety and Alcohol Use

A one-way between groups multivariate analysis of variance (MANOVA) was performed to investigate the hypothesis that participants with elevated social anxiety and alcohol use will report higher levels of FFFS, fear, r-BIS, anxiety, and BAS compared to individuals with lower levels of both social anxiety and
alcohol use. Participants were divided into four groups according to their levels of social anxiety (high, low) and alcohol use (high, low).

For the purpose of this analysis, cut-off values were used to separate data into high and low levels of social anxiety. Established cut-off scores representing clinical levels of social anxiety (e.g., SIAS >=36, SPS >=26; Peters, 2000) were not used due to the discrepancy this caused in cell sizes and because the aim of this study was to measure higher levels of social anxiety in the general population rather than scores indicative of someone who may qualify for a DSM diagnosis of social anxiety disorder. A median split of this data was also problematic as the median scores of this sample were considered to be at an unacceptably low level to be representative of _high_ and _low_ levels of social anxiety (SA total $Mdn=24$).

Given these constraints, an alternative procedure was employed to separate the data by examining frequency distributions. Distribution plots indicated that individuals in the top 20% of the distribution appeared to represent a distinct group of individuals with elevated levels of social anxiety. This group was clearly separated from the remainder of the sample. Based on these distributions, it was determined that a cut-off score of 44.92 for SA total was appropriate. This value represented the lowest score of the top 20% of the sample. Those with scores equal to or above this cut-off were classified as high ($N=121$), and those below this value were considered to be low ($N=426$). A threshold value of 8 on the AUDIT was used, as this has repeatedly been demonstrated to show good sensitivity and specificity at detecting levels of hazardous drinking in the general population in a number of samples (e.g., Conigrave, Hall, & Saunders, 1995; Saunders, et al., 1993; Selin, 2006). Those equal or above a score of eight
on the AUDIT were classified as _high_ (N=283) and those below this cut off were considered to be _low_ (N=264).

Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance matrices (Box’s M=48.90, F(45, 134534.37) =1.06, p=.364), and multicolinearity, with no serious violations noted.

As expected results indicated that there was a significant difference between the groups on the combined dependent variables (F(3,543)=24.23, Wilks’ Lambda=.55, p<.001, partial η²=.18). Means and standard deviations can be seen in Table 4.9. Specifically, univariate tests indicated that the groups differed on FFFS (F(3,543)=32.53, p<.001, partial η²=.15), fear (F(3,543)=62.25, p<.001, partial η²=.26) anxiety (F(3,543)=97.32, p<.001, partial η²=.35), and r-BAS (F(3,543)=22.18, p<.001, partial η²=.11). There was no significant difference between groups for r-BIS (F(3,543)=.70, p=.55, partial η²=.00). Post hoc tests indicated that participants with elevated social anxiety and hazardous alcohol use reported significantly higher levels of FFFS, fear, anxiety, and r-BAS when compared to controls (low social anxiety and alcohol use).

When the same analysis was run with o-BAS, the model explained a similar amount of variance in the combined dependent variables (F(3,543)=24.87, Wilks’ Lambda=.54; partial η²=.19), and o-BAS was found to be significantly different across the groups (F(3,543)=11.41, p<.001, partial η²=.06). Post hoc tests showed that o-BAS was significantly higher in participants with elevated social anxiety and hazardous alcohol use when compared to controls.
Table 4.9

Means and Standard Deviations for Personality Variables for High and Low Levels of Social Anxiety and Alcohol Use

<table>
<thead>
<tr>
<th>Variable</th>
<th>High SA &amp; AUDIT (N=63)</th>
<th>Low SA &amp; AUDIT (N=206)</th>
<th>High SA &amp; low AUDIT (N=58)</th>
<th>Low SA &amp; high AUDIT (N=220)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>R-BAS</td>
<td>20.99</td>
<td>3.48</td>
<td>22.22</td>
<td>3.37</td>
</tr>
<tr>
<td>O-BAS</td>
<td>7.48</td>
<td>3.73</td>
<td>5.85</td>
<td>3.31</td>
</tr>
<tr>
<td>R-BIS</td>
<td>21.89</td>
<td>3.10</td>
<td>21.45</td>
<td>3.09</td>
</tr>
<tr>
<td>FFFS</td>
<td>54.23</td>
<td>6.01</td>
<td>47.00</td>
<td>6.78</td>
</tr>
<tr>
<td>Fear</td>
<td>115.46</td>
<td>47.16</td>
<td>61.34</td>
<td>36.94</td>
</tr>
<tr>
<td>Anxiety</td>
<td>56.04</td>
<td>7.42</td>
<td>37.88</td>
<td>8.89</td>
</tr>
</tbody>
</table>

Note. SA= social anxiety total.

Another MANOVA was performed to determine whether there were differences in Fight, Flight, and Freeze between those with high versus low levels of social anxiety and alcohol use and to test the hypothesis that those with elevated social anxiety and alcohol use will report higher levels of Fight, Flight, Freeze, fear, r-BIS, anxiety, and r-BAS compared to individuals with lower levels of both social anxiety and alcohol use (see Table 4.10). Results indicated that there was a significant difference between the groups on the combined dependent variables ($F(3,543)=19.92, p<.001$; Wilks’ Lambda=.50; partial $\eta^2=.21$).

Univariate tests showed significant differences between the groups for Fight ($F(3,543)=6.86, p<.001$, partial $\eta^2=.04$), Flight ($F(3,543)=17.17, p<.001$, partial $\eta^2=.09$), Freeze ($F(3,543)=62.90, p<.001$, partial $\eta^2=.26$), fear
SOCIAL ANXIETY AND ALCOHOL USE

\(F(3,543)=62.25, p<.001\), partial \(\eta^2=.26\), anxiety \(F(3,543)=97.32, p<.001\), partial \(\eta^2=.35\), and r-BAS \(F(3,543)=37.50, p<.001\), partial \(\eta^2=.17\). There was no significant difference between groups for r-BIS \(F(3,543)=.70, p=.552\), partial \(\eta^2=.00\). Post hoc tests revealed that the high social anxiety/alcohol use group reported significantly higher levels of Fight, Flight, Freeze, fear and anxiety, and significantly lower levels of r-BAS than controls.

Table 4.10

*Means and Standard Deviations for Fight, Flight and Freeze for High and Low Levels of Social Anxiety and Alcohol Use*

<table>
<thead>
<tr>
<th>Variable</th>
<th>High SA &amp; AUDIT (N=63)</th>
<th>Low SA &amp; AUDIT (N=206)</th>
<th>High SA &amp; low AUDIT (N=58)</th>
<th>Low SA &amp; high AUDIT (N=220)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(M) \hspace{1cm} (SD)</td>
<td>(M) \hspace{1cm} (SD)</td>
<td>(M) \hspace{1cm} (SD)</td>
<td>(M) \hspace{1cm} (SD)</td>
</tr>
<tr>
<td>Fight</td>
<td>16.95 \hspace{1cm} 3.55</td>
<td>16.07 \hspace{1cm} 3.93</td>
<td>16.29 \hspace{1cm} 3.91</td>
<td>17.72 \hspace{1cm} 3.90</td>
</tr>
<tr>
<td>Flight</td>
<td>16.55 \hspace{1cm} 3.64</td>
<td>15.03 \hspace{1cm} 3.53</td>
<td>16.76 \hspace{1cm} 3.00</td>
<td>13.92 \hspace{1cm} 3.21</td>
</tr>
<tr>
<td>Freeze</td>
<td>20.74 \hspace{1cm} 2.78</td>
<td>15.90 \hspace{1cm} 3.45</td>
<td>20.40 \hspace{1cm} 3.29</td>
<td>15.77 \hspace{1cm} 3.43</td>
</tr>
</tbody>
</table>

**Differences in Levels of BAS between Participants with Elevated Social Anxiety and Alcohol Use When Compared to Participants with Elevated Social Anxiety Only**

Planned comparisons were conducted to examine whether individuals with elevated social anxiety and alcohol use have higher levels of BAS when compared to those high on social anxiety only (see Table 4.09 for means and standard deviations). Results of the planned comparisons indicated that those who reported high levels of social anxiety and alcohol use also reported...
significantly higher levels of r-BAS when compared to those with high levels of social anxiety and low levels of alcohol use ($F(3,543)= 22.18, p<.001; M$ difference = 1.97, $p<.001$). Similarly, those with high levels of social anxiety and alcohol use reported higher levels of o-BAS ($M=7.48, SD=3.73$) when compared to those with high levels of social anxiety and low levels of alcohol use ($M=6.18, SD=3.76$) ($F(3,543)= 11.41, p<.001; M$ difference = 1.30, $p=.050$).

**Fear and Anxiety as Predictors of Social Anxiety**

In order to test the hypothesis that fear and anxiety would predict social anxiety, a standard multiple regression analyses was conducted. Preliminary analyses were conducted to ensure no significant violations of the assumptions of normality, linearity, multicollinearity and homoscedasticity. Results for these analyses can be seen in Table 4.11. Overall, fear and anxiety accounted for 56.60% of the variance in social interaction anxiety ($F(2544)=354.24, p<.001$). Trait anxiety was the better predictor of social anxiety ($t(3,544)=16.51, p<.001$) accounting for 21.7% of the unique variance in social anxiety. Fear was also a significant predictor of social anxiety ($t(2,544)=9.19, p<.001$) explaining 6.7% of the unique variance in social anxiety.

**Table 4.11**

*Standard Multiple Regression Analyses of Fear and Anxiety on Social Anxiety*

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>Zero-order</th>
<th>$sr^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>1.17</td>
<td>.07</td>
<td>.55</td>
<td>16.51</td>
<td>.000</td>
<td>.71</td>
<td>.22</td>
</tr>
<tr>
<td>Fear</td>
<td>.16</td>
<td>.02</td>
<td>.30</td>
<td>9.19</td>
<td>.000</td>
<td>.59</td>
<td>.07</td>
</tr>
</tbody>
</table>
Discussion

Overview

The current study aimed to investigate the co-morbidity between social anxiety and hazardous alcohol use in a community population using r-RST as a theoretical framework. This study also investigated the role of fear and anxiety and the relationship between these emotions and social anxiety. The current study was the first to investigate revised RST in understanding social anxiety and alcohol use. Results from each hypothesis will be discussed independently below.

As hypothesised, FFFS was positively associated with social anxiety; specifically, Freeze was the most important variable to predict elevated levels of performance and social interaction anxiety. R-BIS was not related to social anxiety as was expected. In line with hypotheses, elevated levels of o-BAS and r-BAS were found to be predictive of problematic alcohol use. However, only a very small amount of variance in alcohol use was explained by r-BAS suggesting that o-BAS and r-BAS may represent distinct motivational processes.

When group differences were tested, participants with elevated levels of social anxiety and alcohol use were found to have significantly higher levels of r-BAS and o-BAS than those with high social anxiety and non-hazardous levels of drinking behaviour. This result was in line with the proposed hypothesis.

When compared to participants with lower levels, individuals with high levels of social anxiety and hazardous alcohol use reported higher levels of FFFS, fear, and anxiety than those with lower levels of social anxiety and alcohol use. There were no group differences for r-BIS. Unexpectedly, individuals high on both social anxiety and alcohol use were found to have significantly lower levels
of r-BAS when compared to the control group. As mentioned FFFS scores were significantly higher in the co-morbid group relative to the control group. In terms of the individuals FFFS components, Freeze was the most important element of FFFS to predict levels of social anxiety, accounting for 24% of the unique variance. Moreover, Freeze was found to be considerably higher in the co-morbid group when compared to controls and thus may be a particularly important variable in discriminating between these groups.

Finally, in line with Gray and McNaughton’s (2000) revisions to RST, the results indicated that fear and anxiety appear to be separable constructs. Whilst fear and anxiety were significantly associated, there was only a moderate correlation between these variables with only 27% of shared variance. This suggests that much of the measurement of fear and anxiety is separable. Furthermore, fear and anxiety were found to independently predict unique variance in social anxiety, which may suggest that they influence social anxiety via difference mechanisms.

Data provided support for the proposed revisions to RST and their role in understanding social anxiety. Specifically, individual differences in r-BAS and FFFS appear to be playing a significant role in understanding social anxiety and alcohol use. Interestingly, r-BIS was not associated with social anxiety as was predicted based on a theoretical understanding of r-RST (Gray & McNaughton, 2000) and findings which had implicated o-BIS in understanding social anxiety (Booth & Hasking, 2009; Coplan, et al., 2006; Kashdan & Roberts, 2006; Kimbrel, et al., 2008). This result is not surprising given the FFFS has replaced the o-BIS in mediating sensitivity to threat and punishment (Gray & McNaughton, 2000). Further, in addition to r-BIS and FFFS an important yet
overlooked factor associated with motivating alcohol use in individuals with social anxiety is reward sensitivity (r-BAS). This finding is consistent with the broader alcohol use literature which has repeatedly implicated reward sensitivity in understanding problematic alcohol use (e.g., Franken & Muris, 2006; Kambouroglou & Staiger, 2001; 2004; 2007; 2009; Loxton & Dawe, 2001).

In the following sections, results of the present study will be discussed in detail. Firstly, results pertaining to r-RST and social anxiety will be discussed, followed by the role of r-RST in understanding alcohol use and co-morbidity. The association between fear and anxiety in relation to understanding social anxiety will be discussed with respect to changes to RST in the recent revisions. Finally, an integration of the results will be provided in addition to conclusions and limitations of the current research.

**RST and Social Anxiety**

Results pertaining to RST and social anxiety were largely consistent with hypotheses and offered support for the contention that r-RST is a useful theoretical framework for examining individual differences in social anxiety. A clear pattern in the hypothesised direction between FFFS and social anxiety was observed; in particular Freeze was determined to be the most important r-RST variable to predict social anxiety. Furthermore, results support the contention that elements of r-RST differ significantly between groups of high versus low levels of social anxiety. Specifically, group analyses indicated that FFFS, particularly Freeze, fear and trait anxiety were associated with elevated levels of social anxiety. This was consistent with social interaction and social performance anxiety. However, the prediction that r-BIS would be positively associated with social anxiety was not supported.
These data provide support for the role of FFFS in understanding social anxiety. Results offered some support for Kimbrel's (2008) suggestion that social anxiety is predicted by elevated FFFS and r-BIS. This prediction was based upon prior research utilising o-RST which purported that o-BIS was responsible for predisposing individuals to elevated social anxiety (Coplan, et al., 2006; Kashdan & Roberts, 2006; Kimbrel, et al., 2008). Given this, it is not surprising that the FFFS was found to be associated with social anxiety as the FFFS has supplanted the o-BIS as the system thought to mediate threat sensitivity and responses to aversive stimuli (Gray & McNaughton, 2000; Smillie, et al., 2006). As previously mentioned, the o-BIS was thought to be sensitive to signals of punishment, anxiety, stimuli considered to be intensive, and innate fear stimuli. The FFFS is now considered to be sensitive to aversive stimuli and responsible for the emotion fear (Gray & McNaughton, 2000). Results indicate that the FFFS is hypersensitive in individuals who experience social anxiety. This indicates that social anxiety is indeed characterised by heightened levels of threat perception and sensitivity to punishing stimuli. Thus, individuals with social anxiety may be particularly responsive to environmental threat. Specifically, findings suggest that individuals with heightened social anxiety are more likely to respond to threat with a freeze response.

The finding that Freeze was vital in understanding social anxiety, in conjunction with no significant differences in Flight, offers novel information in the understanding of individuals with elevated levels of social anxiety in the general population. Indeed, results suggest that individuals with elevated levels of social anxiety (both social interaction and performance) experience fear, anxiety, and tend to freeze in the face of threat rather than utilising avoidance and flight
responses which are likely to significantly interfere with occupational, social and educational tasks. This finding is consistent with research demonstrating that individuals with social anxiety in the general population are less inclined to let anxiety interfere with tasks that they need to perform (Merikangas, et al., 2002). A freeze response may be less detrimental in social situations as fleeing in the face of perceived threat as it allows the individual to physically remain in the social situation. Conversely, avoidance through flight does not allow the socially anxious individual to participate in a task and does not provide an opportunity to build social competence or dispute irrational automatic thoughts.

Results suggesting that individuals with high levels of social anxiety, who do not necessarily meet criteria for SAD, have an underlying tendency to freeze in response to threat, may provide us with an understanding of some of the predisposing factors that may be implicated in understanding social anxiety in this population. Symptoms associated with freezing in response to threat (e.g., increased respiratory rate, decreased salivation, increased vigilance, posturing) have been observed in animal studies (Davis, 1992) and are reportedly experienced and observed in individuals with social anxiety in community populations (Beidel, Turner, & Dancu, 1985; Westberg, Lundh, & Jönsson, 2007). Additionally, socially anxious individuals report cognitive symptoms such as thought blocking, depersonalisation, and even disassociation in the face of social situations (Beidel, et al., 1985). This may be displayed by behaviours such as inhibiting engaging in conversation or providing an opinion in these situations. Results suggest that the presentation of social anxiety in subclinical groups may report or experience more ‘freeze’ type symptomatology due to their underlying
predisposition. This is quite distinct from individuals with SAD, who must experience flight or avoidant behaviours to fulfil diagnostic criteria (APA, 2000).

According to the animal literature upon which revisions to RST were made, Freeze is activated when threat is proximal and an escape is unavailable (e.g., Blanchard, Griebel, et al., 2001; Blanchard & Blanchard, 1989; Gray & McNaughton, 2000). Indeed, social situations are perceived to be innocuous for most people; however they have the potential to be perceived as threatening by socially anxious individuals, in part, due to a heightened threat detection system (FFFS). It seems that socially anxious individuals respond to perceived threats in their environment through the freeze mechanism. However, an understanding of threat perception such as perceived proximity and escapability were not assessed in the current study so these potential mediating factors are speculative at this time and will constitute a primary focus of study two.

As previously noted, o-BIS was found to be a more strongly associated with social anxiety than FFFS. O-BIS, as measured by the SP subscale of the SPSRQ (Torrubia, et al., 2001), is a measure of general threat sensitivity which encompasses both anxiety and fear responses. Elements of the FFFS are comprised in the measurement of o-BIS which also includes measurement of broader elements of threat sensitivity. Given this, it is not surprising that o-BIS would be such as strong predictor of social anxiety.

The conceptualisation of BIS has undergone substantial revision (Gray & McNaughton, 2000). Consequently, the r-BIS is now considered to be responsible for mediating responses to goal conflicts; for example, those which elicit approach-avoidance conflict (Corr, 2011). Heightened r-BIS sensitivity
was anticipated in individuals with high levels of social anxiety. This hypothesis was developed upon the understanding that social situations frequently contain the potential for reward and threat, which may initiate a goal conflict. For example, entering into a social environment may offer group membership or friendship (protection), or alternatively alienation or aggression (injury, non-protection). Such conflicting stimuli is said to initiate an approach-avoidance conflict, activating the r-BIS which precedes a scan of relevant salient memories and the environment in order to resolve this conflict (Corr, 2011). Approach-avoidance conflicts are thought to result in an anxiety response while the individual establishes an appropriate method of action, approach (utilising the r-BAS) or avoidance (FFFS) (Corr, 2011; Gray & McNaughton, 2000; Smillie, et al., 2006). Despite these theoretical predictions of the involvement of r-BIS in understanding social anxiety, r-BIS was not found to be involved in understanding social anxiety in any analyses conducted.

The finding that r-BIS was not associated with social anxiety may reflect a lack of goal conflict experienced by this particular sample. This may be due to a number of factors. One explanation may pertain to the nature of the sample. It is possible that this largely subclinical group of individuals with elevated social anxiety do not feel as though they need to conduct a risk assessment in social situations. It may be that for the large part, individuals with elevated levels of social anxiety are able to avoid situations which cause them such distress; thus, circumventing any necessity to perform a risk assessment. Indeed, in their revisions to RST, Gray and McNaughton (2000) specified that the BIS is now only activated when threatening situations → must be approached" (p. 84). This is important in the context of prior research which has suggested that individuals in
the general population who have elevated but not clinical levels of social anxiety are better able to avoid situations which precipitate social anxiety (Merikangas, et al., 2002). Given this, individuals may not frequently be faced with the situation where they must reconcile a conflict between having to approach a situation which may offer some form of reward which concurrently causes them significant discomfort. Moreover, it is also possible that FFFS sensitivities preponderate any potential conflict from the r-BAS thus negating the need to conduct a risk assessment. That is, their fear response outweighs any potential for reward in social situations. Whilst both of these explanations are plausible, further research is clearly required to clarify this process.

A curious finding from the research was group differences between those with high versus low levels of social anxiety in trait anxiety, but not r-BIS. Given r-BIS is the main system responsible for the emotion of anxiety (Corr, 2011) theoretically one would expect group differences to be observed for r-BIS as well as trait anxiety. However, r-BIS and trait anxiety were found to be only weakly related in this sample, which is disparate from the theoretical relationship between these variables (Gray & McNaughton, 2000). R-BIS is considered to be the system responsible for conducting risk assessments and resolving conflicts between competing goals, for example approach (e.g., entering into a conversation) and avoidance (e.g., not entering into a conversation due to fear of scrutiny) (Corr, 2011; Gray & McNaughton, 2000). Given this, results indicate that the conflict resolution measured by the r-BIS is not as relevant in understanding social anxiety in this population as is general trait anxiety.

In conclusion, the present study suggests that FFFS, specifically Freeze, is the most important predictor of social anxiety. Whilst it was expected that r-BIS
involvement would motivate a risk assessment and anxious approach, particularly as social situations were expected to be perceived to be both rewarding and threatening by socially anxious individuals, this was not supported by results. Results also indicated that o-BIS, fear and trait anxiety were elevated in the socially anxiety group. Results offer partial support to Kimbel's (2008) proposition that FFSS and r-BIS are activated in those with SAD. Results may reflect the nature of the sample which served to measure social anxiety in a community population, thus generally had lower levels of social anxiety than individuals with SAD. Thus, replication in a clinical population may serve to determine if any differences are observed in individuals placed higher on the social anxiety continuum.

BAS and Alcohol Use

Another pattern observed in the hypothesised direction was the positive relationship between o-BAS and r-BAS and alcohol use. Group differences were also found when hazardous drinkers were compared to a control group. Specifically, hazardous drinkers reported significantly higher levels of o-BAS and r-BAS when compared to controls. However, whilst results were significant r-BAS only contributed a small amount of variance in explaining alcohol use. This is an interesting finding which appears to highlight differences in the understanding of BAS processes in motivating alcohol use.

As expected, o-BAS was found to be significantly associated with problematic alcohol use. This is consistent with a strong literature base which has demonstrated this relationship using various methodologies in a variety of populations (e.g., Franken, 2002; Franken & Muris, 2006; Hundt, et al., 2008; Kambourouloupolos & Staiger, 2001;2004; Zisserson & Palfai, 2007). Traditionally,
the o-BAS was conceptualised to be related to positive affect in response to rewarding stimuli or signals of reward (Corr, 2008b). In contrast, and in line with revisions to RST, the r-BAS is associated with ‘anticipatory pleasure’ considered to motivate ‘spatiotemporal proximity’ with reward by directing attention to rewarding stimuli, seeking out stimuli that may be pleasurable and motivating appetitive behaviour towards arousing stimuli (Corr, 2011; Gray, 1994, p. 40). This construct was captured in the Jackson (2009) r-RST measure of r-BAS (e.g., I actively look for new experiences”, “look for new sensations”). Thus, it seems that the original and revised BAS are slightly different constructs capturing different elements of appetitive motivation; 1) individual differences in positive responses to obtained reward (o-BAS), and 2) individual differences in appetitive motivational behaviour towards potential rewards (r-BAS).

These conceptualisations also differ in their inclusion of impulsivity. Past measures of RST often captured elements of rash impulsivity (i.e., acting without forethought for consequences) and extraversion in their o-BAS subscales (Jackson, 2009). However, revisions of the theory highlight the importance of a positive relationship between r-BAS and extraversion and functional impulsivity (the ability to make quick decisions under stressful conditions) (Jackson, 2009). One potential explanation for these findings is that hazardous drinkers are more sensitive to rewards once they are received and are rash impulsive; however, they are not likely to attain longer term appetitive goals, seek out and get closer to rewards or utilise their impulsivity in a functional manner. This distinction has not been considered in prior work and may be a focus for future research. By measuring both conceptualisations of BAS, unique understandings of these constructs can be obtained. A level of behavioural constraint and planning is also
required in order to achieve some rewards particularly if the temporo-spatial
distance from the desired item is distal, whereas impulsive behaviour is required
to obtain a reward at close proximity (Pickering & Smillie, 2008). Thus, r-BAS is
thought to highlight the need to sustain approach behaviour for extended time
periods without the immediate reinforcement that might be seen after a rash
impulsive act (Pickering & Smillie, 2008). Whilst this is speculative, it may draw
attention to some of the different aspects of BAS measured within the current
study. This explanation may offer an avenue for future research to investigate.

The distinction between the drive to seek out potential rewards in the
environment, and behaviour which elicits quick access to positive affect is not
new (Dawe, Gullo, & Loxton, 2004; Gullo & Dawe, 2008). In their factor
analyses of o-RST items from their o-RST scale, Carver and White (1994)
reported that three related factors emerged from the data: '_fun seeking_', which
describes a rash impulsive approach for novel and stimulating sensations, '_drive_
which measures appetitive behaviour towards desired outcomes, and '_reward
responsiveness_' which considers the affective response to obtained rewards. In
the development of another scale, the Gray Wilson Personality Questionnaire
(GWPQ; Knyazev, Slobodskaya, & Wilson, 2004) the authors suggested that their
'_approach_' and '_fight_' subscales should be conceptualised as two factors
underpinned by the BAS. Whilst the structure of the BIS/BAS scales has been
replicated in a number of samples (Heubeck, Wilkinson, & Cologon, 1998;
Leone, Perugini, Bagozzi, Pierro, & Mannetti, 2001), there has been no such
replication of the GWPQ findings. Exploratory factor analyses of various
existing measures utilised in RST research to measure BAS, including the
SPSRQ, BIS/BAS scales, and GWPQ, have also found items to group into two
different factors which appear to reflect 1) rash impulsivity/sensation seeking and 2) appetitive motivation (Caseras, Ávila, & Torrubia, 2003; Knyazev, Slobodskaya, & Wilson, 2004; Zelenski & Larsen, 1999). Results in such studies suggest there is some statistically driven evidence for a multi-dimensional approach of measuring r-BAS. Results from the current study appear to be congruent with suggestion that the measurement of BAS is multifaceted. Such findings are not surprising due to the complexity of measuring RST constructs (Smillie, 2008a; Smillie, et al., 2006), which is compounded by a lack of clarity surrounding the expression of BAS on a trait level (Diaz & Pickering, 1993; Torrubia, et al., 2008).

In summary, results indicate that one element of BAS that is particularly important to understanding alcohol use is the experience once a reward is close or has been received, as measured by the o-BAS. O-BAS was found to be associated with alcohol use as has been repeatedly demonstrated in past research (e.g., Franken, 2002; Kambouropoulos & Staiger, 2001; 2004; Loxton & Dawe, 2001). As discussed, r-BAS plays only a small role in understanding alcohol use. Results suggest that it is the positive responses to obtained rewards that motivate alcohol use rather than an underlying drive for appetitive behaviour for conditioned and unconditioned stimuli. Laboratory studies investigating BAS output behaviours (e.g., appetitive behaviours and sensation seeking/impulsive pleasure seeking) are recommended to explore avenues through which the BAS motivates hazardous alcohol use and to further explore the role of r-BAS in understanding alcohol use.
RST and Co-morbid Social Anxiety and Problematic Alcohol Use

One of the primary aims of the study was to investigate group differences to obtain a clearer understanding of the relationships between r-RST variables in high and low levels of social anxiety and alcohol use. Results indicated that participants with high social anxiety and hazardous alcohol use reported significantly higher levels of FFFS, fear, anxiety and o-BAS than controls. There were no significant differences in r-BIS and, unexpectedly, r-BAS was higher in controls than the high co-morbidity group. However, r-BAS and o-BAS were found to be significantly higher in participants with high levels of social anxiety and co-morbid hazardous alcohol compared to those with high levels of social anxiety and non hazardous alcohol use. Results also appear to indicate that there is a unique relationship between low social anxiety and high alcohol use and r-BAS.

Hypotheses regarding the involvement of r-BIS, FFFS, fear and anxiety in understanding the relationships between high and low levels of social anxiety and hazardous/nonhazardous alcohol use were derived from a theoretical proposition which suggests high levels of r-BIS (anxiety) and FFFS (fear) to predispose personality traits such as shyness, behavioural inhibition and neuroticism in adults (Kimbrel, 2008). Such traits are reported by Kimbrel (2008) to cause hypervigilance in social situations and cognitive biases which become increasingly salient when r-BIS draws on the FFFS while conducting risk assessments (Corr, 2011; Kimbrel, 2008). According to this proposition, detrimental social experiences (e.g., bullying, rejection by a peer) are thought to perpetuate the risk for generalised SAD by increasing FFFS sensitivity to social stimuli (Kimbrel, 2008).
However, results appear to indicate that this theoretical account for SAD was not supported in this community sample, as r-BIS sensitivity was not significantly different between high and low levels of social anxiety and problematic alcohol use. This is an interesting result as r-BIS is considered to be the system thought to underpin the emotion of anxiety (Corr, 2011; Gray & McNaughton, 2000). Furthermore, given social situations are thought to expose one to the potential for reward and punishment it was expected that r-BIS sensitivity would be heightened in individuals with elevated levels of social anxiety. Rather, results appear to highlight the importance of the system underpinning fear and threat detection, the FFFS, in understanding the relationship between those with elevated co-morbidity when compared to controls. This is a novel finding, particularly as FFFS sensitivity is predicted to be associated with disorders such as the phobias and panic, whereas the r-BIS is theoretically considered more closely aligned with the anxiety disorders (Gray & McNaughton, 2000). This suggests that individuals with subclinical levels of social anxiety and hazardous drinking report responses to threat which are more in line with the panic and freeze elements of social anxiety rather than the risk assessment and avoidance typically seen in individuals with SAD (Antai-Otong, 2008).

Data also indicated a curious discrepancy in r-BAS function in high and low levels of social anxiety and alcohol use. That is, r-BAS was higher in controls when compared to those with elevated social anxiety and hazardous alcohol use; however, r-BAS was significantly higher in the co-morbid group compared to those with high social anxiety and nonhazardous alcohol use. These results appear to indicate that social anxiety is related to a lower level of r-BAS.
This is supported by a weak yet significant negative relationship between social anxiety and r-BAS.

It is possible that these results can be explained by the Joint Systems Hypothesis (JSH) which highlights the importance of inhibitory and facilitatory processes between RST systems. Corr (2002a) provided a theoretical application of this hypothesis to r-RST describing the JSH as a model to explain the interaction between RST systems. Corr specified that activation of the FFFS and r-BIS inhibit the r-BAS when presented with aversive stimuli. Furthermore, r-BAS activation is thought to inhibit the FFFS and r-BIS when presented with stimuli that motivate appetitive behaviour. R-RST systems are thought to be interacting or independent under different circumstances. Specifically, Corr specified that these systems are independent when a) when strong aversive or appetitive stimuli are used, b) in cases with individuals with very high levels on the RST subsystems, and/or c) when set shifting between appetitive and aversive stimuli is required. These specifications which suggest independence of the systems no not appear to have been met in the present study; thus, interactions between the systems may have contributed to findings. Given this information, it could be argued that lower levels of r-BAS in the co-morbid group is consistent with the JSH. Specifically, the FFFS may be serving to inhibit the r-BAS in the high social anxiety/hazardous drinking group, yet does not have the same effect in the low social anxiety group in which the FFFS was found to be significantly lower. The contention that the JSH is implicated in understanding social anxiety is consistent with one prior study which found social interaction anxiety to not only be positively associated with o-BIS sensitivity but negatively related to o-BAS (Kimbrel, et al., 2010). Another study also found a negative correlation
between social anxiety and o-BAS (Kashdan, 2002); however, r-BIS was not measured in this sample.

Another interesting finding was that the r-BAS and o-BAS appeared to reflect different motivational processes underpinning group differences in hazardous alcohol use and social anxiety. O-BAS was found to be significantly higher in the high social anxiety and alcohol use group when compared to controls. In contrast, the opposite was found in the measurement of r-BAS with results indicating significantly higher levels in controls when compared to the high social anxiety and hazardous alcohol use group. As previously discussed, the differences between r-BAS and o-BAS in understanding this co-morbidity may relate to conceptual differences in the measurement of BAS; with r-BAS reflecting appetitive behaviours toward reward and o-BAS reflecting individual differences in positive responses to obtained reward.

As expected, results did not support the proposed contention that co-morbid social anxiety and problematic alcohol use could be explained by elevated levels of r-BIS and FFFS (Kimbrel, 2008) which was proposed on the basis of an aversive model of understanding this co-morbidity, the ‘self-medication hypothesis’ (Khantzian, 1985). Rather, it seems FFFS is the most important factor differentiating between those with high levels of social anxiety and problematic drinking behaviour from controls. In addition, appetitive motivational processes appear to be implicated in motivating those with elevated levels of social anxiety to initiate hazardous drinking behaviours.

Results offer unique insights into the motivational processes implicated in understanding social anxiety and co-morbid hazardous alcohol use. Findings
indicate that individuals with high levels of co-morbidity do not have higher levels of appetitive motivation. Elevated r-BAS was expected in this group of hazardous drinkers due to the abundance of literature linking o-BAS to alcohol use (e.g., Franken, 2002; Franken & Muris, 2006; Kambouropoulos & Staiger, 2001; 2004; 2007; 2009; Kimbrel, et al., 2010; Loxton & Dawe, 2001). Additionally, individuals with this co-morbidity do not appear to experience the goal conflict, implicating the r-BIS, which was predicted to be significantly higher in socially anxious participants. Instead, for socially anxious individuals the FFFS is hyperactive, causing the tendency to freeze in the face of threat. A freeze response has been shown in lower mammals to be associated with the perception of threat as inescapable, highly intense, and proximal (Blanchard & Blanchard, 1989). Further research is required to determine whether threat perception and defensive behavior is implicated in understanding the relationship between r-RST, social anxiety and co-morbid alcohol use.

**Fear and Anxiety**

Finally, the findings reported here provide some additional evidence to suggest that fear and anxiety may be separable constructs (Gray & McNaughton, 2000). Specifically, these variables were only moderately correlated with 73% unshared variance. Additionally, fear and anxiety independently predicted unique variance in social anxiety. This finding provides further evidence that fear and anxiety are uniquely contributing to different aspects of social anxiety.

Results offer support to the separation of fear and anxiety as separable constructs in the revised RST (Gray & McNaughton, 2000). This distinction was based upon a series of experimental studies investigating reactions to threat in animals (e.g., Blanchard & Blanchard, 1988; Blanchard & Blanchard, 1989;
Blanchard, et al., 1997). Based on the Blanchard’s research, two classes of behaviour are noted; that which moved one away from threat and was sensitive to panicolytic drugs but not anxiolytics (attributed to fear, activated by the FFFS), and one which required a risk assessment and movement towards a potential threat which was sensitive to anxiolytics but not panicolytics (anxiety, activated by r-BIS). This is a distinct change in RST since the original conceptualisation as it suggests that fear is an important element of personality which is conceptually distinct from anxiety.

Results are consistent with the small number of studies that have investigated the distinction between fear and anxiety in human populations (Cooper, et al., 2007; Hagopian & Ollendick, 1996; Perkins, et al., 2007; Weeks, Heimberg, & Rodebaugh, 2008; Weeks, Heimberg, Rodebaugh, et al., 2008). For example, Hagopian and Ollendick (1996) found anxiety, as measured by the STAI (Spielberger, et al., 1983), to be only moderately correlated ($r = 0.38$) with the Fear Questionnaire (Marks & Mathews, 1978), a measure designed to assess avoidant behaviour of a number of social and medical situations and phobic stimuli. Similarly, using factor analysis Cooper et al. (2007) found fear to be distinct from anxiety and the original conceptualisation of o-BIS using the same measures utilised in the current study. Results from another CFA, confirmed that a two factor model (r-BIS-anxiety, FFFS-fear) of the o-BIS subscale (Carver & White, 1994) was a better fit than a one factor model (Heym, et al., 2008). Results also support findings from Perkins et al.’s (2007) study which reported that the FFFS and STAI independently predicted behavioural outcomes on military tasks. Results from the current sample add further support to the revisions of RST by demonstrating that fear and anxiety appear to be distinct
constructs, and independently contributed to unique variance in understanding social anxiety in this community sample.

These findings highlight the importance of the concept of defensive direction in understanding social anxiety, as fear is thought to motivate people to navigate away from threats whereas anxiety is thought to motivate anxious appetitive behaviour (McNaughton & Corr, 2004). As fear and anxiety appear to be separable constructs, by extension it could be predicted that there would also be differences in defensive direction. That is, defensive behaviour (e.g., fight, flight, approach, avoid) is conditional upon defensive direction which distinguishes between threats that elicit fear and avoidance (e.g., giving a speech) and those which require a risk assessment and anxious approach (e.g., being required to give a speech as requirement for a course credit). Those with higher levels of trait anxiety are considered to perceive stimuli that elicit approach behaviour as more threatening, whereas those with high levels of trait fearfulness are more sensitive to threats that do not necessitate appetitive behaviour. Whilst fear and anxiety were found to be somewhat distinct in the present data (Cooper, et al., 2007; Perkins, et al., 2007), the role of threat perception and defensive behaviour has not been investigated in understanding social anxiety.

Limitations

A particular constraint of this study was its cross-sectional design which precludes any causal inferences. It has been argued that the FFFS is the primary mechanism underlying social anxiety, and that BAS plays a role in motivating drinking behaviour; however, this was only observed in differences between groups on self report measures of RST at one time point. Longitudinal research is recommended to investigate r-RST sensitivities to determine whether these
predict onset of social anxiety and co-morbid hazardous drinking behaviour over time.

Further, whilst it has been argued that r-RST constructs are one mechanism underpinning social anxiety and alcohol use, this has only been observed using self report measures. As behavioural assessments were not conducted, further assessment using this methodology is recommended. Additionally, some of the internal consistencies seen in the FFFS and r-BIS subscales of the Jackson 5 (2009) measure were slightly lower than an acceptable level of reliability. Given this, interpretations using these scales need to be made with caution. Further investigation into this new scale is warranted.

This sample comprised individuals from a community population in which social anxiety and hazardous alcohol use were significantly albeit weakly correlated. In addition, measures of social anxiety and alcohol use were derived from self report questionnaires. Therefore, it is not clear whether the findings reported here are representative of the motivational processes underpinning those who fulfil the criteria for social anxiety disorder. It is expected that SAD and AUDs will be more highly correlated, and different motivational processes may be implicated. Whilst Kimbrel (2008) focuses exclusively on aversive motivational processes in understanding SAD and co-morbid AUDs, the current study provides evidence that in non-clinical samples, appetitive motivation is an important factor. Additional research with a sample of clinically diagnosed SAD and AUDs would allow for a clearer understanding of those at the higher end of the social anxiety spectrum with problematic alcohol use. Findings should be considered in light of these limitations; however this study does offer preliminary support for the role of r-RST in understanding these behaviours.
Conclusion

By employing r-RST, the current study was the first to investigate the influence of appetitive and aversive motivational processes on social anxiety and alcohol use concurrently. Motivational models typically utilised (e.g., the tension-reduction theory, Conger, 1951; the self-medication hypothesis; Carrigan & Randall, 2003) purport to explain this co-morbidity by aversive motivation, that is, that alcohol use is developed and perpetuated due to the anxiolytic effects of the drug via negative reinforcement processes. Such theories cannot account for the role of aversive and appetitive motivational processes found to underpin social anxiety and alcohol use in the current study.

Whilst theoretical accounts hypothesised that the FFFS and r-BIS would predict the co-morbidity between social anxiety and hazardous drinking (Kimbel, 2008), the current study found the FFFS to be the most important r-RST system involved. The current study expanded upon this by exploring the different components of FFFS, finding Freeze to be the most important output of the FFFS in understanding social anxiety. Incongruent to predictions, r-BIS was not associated with social anxiety indicating that, at least in this sample, there appears to be no indication of conflict of competing goals underlying social anxiety.

Results indicate that socially anxious individuals do not flee from threat or act aggressively in retaliation; rather, they may be more likely to experience heightened fear and anxiety, and reported a heightened predisposition toward inhibitory behaviours when faced with threat (e.g., freeze). Based on animal literature (Blanchard & Blanchard, 1989), it was speculated that this may be perpetuated by the perception of threat as proximal, of high intensity, and inescapable; however, further research is required to make this determination.
Results also highlighted the role of appetitive motivation in understanding social anxiety and hazardous drinking with results indicating differences between original and revised BAS processes. It appears that it is the reward once a stimuli is received that motivates alcohol use rather than an underlying drive for appetitive behaviour for conditioned and unconditioned stimuli. These two different elements of BAS processes appear to be utilising different mechanisms, one designed to measure individual differences in positive responses to obtained rewards (o-BAS) and the other designed to measure appetitive behaviour towards conditioned and unconditioned stimuli (r-BAS); thus have independent motivational functions in predicting alcohol use behaviour.

Consistent with an array of past alcohol research (e.g., Hundt, et al., 2008; Kambouropoulos & Staiger, 2001; Kimbrel, et al., 2010; Loxton & Dawe, 2001), o-BAS was significantly higher in hazardous alcohol drinkers with co-morbid social anxiety when compared to controls. R-BAS was also found to be significantly higher in those with elevated co-morbidity when compared to those with high levels of social anxiety but nonhazardous alcohol use; indicating that r-BAS plays a vital role in motivating alcohol use in those with elevated social anxiety. However, when the co-morbid group was compared to controls, r-BAS was significantly lower in the high social anxiety/hazardous drinking group. Taken together, these findings are in accordance with the JSH (Corr, 2002) which predicts that heightened aversive motivational processes (e.g., anxiety) should be observed in individuals with both high threat sensitivity (e.g., FFFS) and low reward sensitivity (e.g., BAS). Another possible explanation for these findings is that o-BAS is driving hazardous alcohol use in individuals with subclinical social anxiety, leading to the development of co-morbidity. Yet in individuals with
clinical levels of SAD-AUDs aversive motivational processes become dominant as individuals begin to primarily consume alcohol to alleviate high levels of anxiety. However, this proposition cannot be tested in this non-clinical sample.

Finally, data offers some support for the contention that fear and anxiety are separable constructs, in line with revisions to RST (Gray & McNaughton, 2000) and the animal studies underpinning these revisions (e.g., Blanchard, Griebel, et al., 2001; Blanchard & Blanchard, 1989; Blanchard, et al., 1997). This result raises questions regarding the treatment of these different elements of social anxiety. This will be discussed further in the general discussion (chapter six).

In summary, contrary to current motivational models understanding social anxiety and alcohol use, data suggests that the combined influence of aversive and appetitive motivational processes are implicated in understanding this co-morbidity. By employing RST, this study extended upon the theoretical work of Kimbrel (2008) by being the first to empirically test the role of the r-RST in understanding social anxiety and alcohol use. Whilst Kimbrel focused exclusively upon aversive motivation in understanding SAD and co-morbid AUDs, this study extended upon this model by investigating aversive and appetitive motivational processes in individuals with sub-threshold social anxiety, a precursor for developing SAD (Ollendick & Hirshfeld-Becker, 2002). The current study also highlighted the importance of understanding fear and anxiety as separable constructs. Results have provided valuable insights which may be expanded upon to obtain further understanding of this highly common and detrimental co-morbidity.
Chapter Five: Study Two- R-RST, Defensive Direction, Defensive Distance, and Threat Perception in understanding Social Anxiety and Alcohol Use

Introduction: Defensive Direction and Distance

As discussed in chapter two, r-RST postulates that responses to potential threats are dependent upon _defensive direction_ which distinguishes between threatening stimuli that elicit fear and avoidance, elicited by the FFFS, and those that require risk assessment and anxious approach which requires r-BIS activation (Gray & McNaughton, 2000). R-RST postulates that those high in trait anxiety are more inclined to perceive a stimulus requiring approach as threatening, and those high in trait fearfulness are more sensitive to threats which to not require approach (Gray & McNaughton, 2000; Perkins, et al., 2010).

An r-RST construct thought to apply equally to fear and anxiety is _defensive distance_ (Gray & McNaughton, 2000) or _defensive intensity_ (Perkins & Corr, 2006) which describes how a behavioural response to a threat is conditional on the proximity of the threatening stimuli. Proximal threats are thought to activate lower neural levels (e.g., the periaqueductal gray) which initiate ingrained responses such as flight, fight, and freezing. With increasing (perceived) distance of the threat, higher neural networks are gradually activated (e.g., the prefrontal cortex) eliciting increasingly complex and considered responses such as that required for risk assessment or rumination (McNaughton & Corr, 2008). By obtaining an understanding of defensive behaviour, that is defensive distance and intensity, results may serve to clarify the relationship between r-RST, social anxiety and co-morbid alcohol use. This will be discussed in detail below.
Defensive Direction and Distance: Empirical Evidence with Rodents

Much of what is understood about threat response stems from research with rodents (Blanchard, Griebel, et al., 2001; Blanchard, et al., 1997). It has been frequently suggested that defensive behaviour observed in lower mammals, such as rodents, can help develop understanding of emotional processes in humans (Blanchard & Blanchard, 1988; Blanchard & Blanchard, 1989). In a number of studies spanning thirty years, researchers have investigated patterns of innate defensive behaviour (e.g., Blanchard & Blanchard, 1988; Blanchard, Hynd, et al., 2001; Blanchard & Blanchard, 1989; Blanchard, et al., 1997). It has been argued that threat inducing stimuli (e.g., predators, dangerous situations), the type of reaction, and the effect of the defensive behaviour on the threatening situation are similar across different mammals. This has lead researchers to suggest that the neurobiological systems underpinning defence behaviour is analogous across different species, including humans (Blanchard, et al., 1997).

Using ethoexperimental approaches (e.g., _the visible burrow system_; Blanchard, et al., 1989; Blanchard, et al., 1995) with rodents, approximately five defensive behaviours have been established as being elicited by threatening stimuli; these are fight, freezing, defensive threat, defensive attack, and risk assessment (Blanchard, Hynd, et al., 2001). These responses are heavily influenced by the situation in which they are experienced and the stimuli which elicits the behaviour (Blanchard, Hynd, et al., 2001). For example, when faced with a highly threatening situation flight is elicited when an escape is possible. If an escape is impossible, freeze is initiated; however, as the threat becomes closer in proximity a defensive threat (e.g., a loud vocalisation) followed by a defensive attack is typical (Blanchard, et al., 1989). If faced with an ambiguous situation or
potential yet unclear threat, rodents appear to assess their level of risk by approaching the stimuli to investigate it further (Blanchard, et al., 1989; Pinel & Mana, 1989).

Heightened defensiveness is a key characteristic of clinical diagnoses such as the anxiety disorders (APA, 2000). Given this, pharmacological studies have been undertaken to obtain a clearer understanding the effects of anxiolytic medications on rodent behaviour (Blanchard, Griebel, et al., 2001; Blanchard, et al., 1997). Research demonstrated that medication targeted to treat Generalised Anxiety Disorder (e.g., Benzodiazepines) reduce the risk assessment and defensive attack or threat aspect of rodent defence behaviour (Blanchard, et al., 1997), whereas medications to treat Panic Disorder reduce flight behaviour but not other defence behaviours in rodents (Blanchard, Griebel, et al., 2001). This indicates that defensive reactions fall into two different clusters, one which relates to fear and the other avoidance (Perkins & Corr, 2006); a contention which is supported by prior research (Cooper, et al., 2007; Heym, et al., 2008; Perkins, et al., 2007) and study one of the current thesis which indicated that fear and anxiety are related but separable constructs. R-RST (Gray & McNaughton, 2000) purports that these two different clusters represent the activation of neurological systems, one which controls anxiety (r-BIS) another which activates fear (FFFS); these two systems underpin aspects of personality and psychopathology (Gray & McNaughton, 2000). Thus, defensive direction is thought to be one factor which elicits the activation of the FFFS or r-BIS which then stimulates the emotional response to the stressor, fear or anxiety (Perkins & Corr, 2006).
Defensive Direction and Distance: Empirical Evidence with Humans

The close link between defence behaviour and emotion has allowed for processes which have been repeatedly demonstrated in rodent research to be tested in humans in a reasonably straightforward manner (e.g., Blanchard, Hynd, et al., 2001; Perkins, et al., 2010; Perkins & Corr, 2006). Consequently, interest in this area has simulated a small number of investigations into the link between defence behaviours in rodents and that of humans (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010; Perkins & Corr, 2006). Table 5.1 offers a summary of findings derived from these studies.

In the first of these studies, researchers investigated whether defence processes seen in rodents were parallel to human behaviour (Blanchard, Hynd, et al., 2001). Using a set of 12 vignettes describing threatening scenarios (see method section for the current study for a description), researchers elicited primary defensive responses to various situations from 160 psychology students (79 females, 81 males). Hypotheses in this study were derived from the animal literature (e.g., Blanchard & Blanchard, 1988; Blanchard, Griebel, et al., 2001). Specifically, results indicated that there was a positive relationship between threat ambiguity and risk assessment, that defensive attack was significantly reduced if there was a means for escape provided in the scenario, defensive threat (e.g., yell/scream) was also correlated with inescapability, and larger distances from threat were not related to defensive attack or freezing. Interestingly, researchers also found that participant’s primary reaction to threat was to flee; this behaviour was consistent among men and women and in line with animal studies. Sex differences were also noted as women were more likely to yell/scream/call for help whereas men reported a greater propensity to attack and struggle in the face
of threat. Despite this, some behaviour commonly seen in animal research was not seen. For example, the tendency to freeze in inescapable situations was not found, nor was the flight response utilised when threats were escappable; researchers suggest that the latter may be related to the respondent’s tendency not to run from ambiguous stimuli.

Perkins and Corr (2006) replicated Blanchard et al.’s (2001) study in a sample of 141 students (58 males, 83 females). They utilised the same methodology as Blanchard et al. to test Gray and McNaughton’s (2000) prediction that self reported fear scores (FSS; Wolpe & Lang, 1977) would be positively associated with movement away from threat, and that trait anxiety scores (STAI; Spielberger, et al., 1983) would be related to orientation toward threat and to replicate results linking defensive behaviour of rodent to that of humans. Results were largely consistent with those reported by Blanchard et al. (2001). Specifically, participants were less likely to flee and more likely to conduct a risk assessment in reaction to ambiguous stimuli; they were most likely to flee in the face of threat when they were escappable and when there was a clear danger present; and they were less likely to defensively attack when the threat was more escappable and when the threat was perceived to be further away. However, the frequency of defensive attack was not significantly associated with the ambiguity of the threat stimuli, nor was the frequency of flight related to inescapability. Finally, results did not support Blanchard et al.’s (2001) finding that the frequency with which people tended to hide was positively associated with the availability of a place to hide. Perkins and Corr (2006) also found that participants reporting low levels of trait anxiety were less likely than those with higher levels of trait anxiety to select defensive behaviours which related to risk
assessment and defensive threat; such a finding is consistent with results found in rodents dosed with anxiolytic medications (Blanchard, et al., 1997). Interestingly, participants with high levels of trait anxiety were found to respond to threats less intensely than participants with low trait anxiety; a finding reported speculated to be consistent with RST due to the activation of the o-BIS in anxiety provoking situations which is thought to inhibit behaviour. This inhibition changes the perceived intensity of the threat. Moreover, whilst fear scores were found to be correlated with orientation away from threat in the overall sample; this behavioural response was found to be exclusive to the male but not female participants. Whilst correlational analysis found no relationship between anxiety and defensive direction, regression analysis which included other significant predictors of defensive direction (psychoticism, fear, and o-BIS) found a significant yet only marginal relationship between these variables. Results indicate that fear and anxiety are associated with different defensive processes. Specifically, individuals with high levels of anxiety were more likely to select behavioural responses to threat that represent risk assessment behaviour. Moreover, fear but not anxiety was associated with orientation away from threat. Whilst there was some suggestion that anxiety was associated with orientation towards threat, the data regarding this was mixed. As trait fearfulness and anxiety are elevated in individuals with social anxiety, as demonstrated in study one of this thesis, gaining a clearer understanding of the motivational processes associated with defensive behaviours, fear and anxiety may have implications for our understanding of social anxiety.

In another study Perkins et al. (2010) investigated defensive reactions in two studies; the first designed to replicate findings from the Perkins and Corr
(2006) study, and the second to determine whether highly fearful individuals perceive threat to be particularly proximal. The first study comprised 173 participants, most of whom were university students. Results extended upon findings by Perkins and Corr (2006) in finding that heightened fearfulness, but not heightened trait anxiety, was correlated with the tendency to flee from threat in the whole sample. However, in contrast with Perkins and Corr’s findings, anxiety was not related to an orientation towards threat in this study. There were also no significant relationships between o-BIS, anxiety and fear and defensive intensity. Researchers queried whether this result might be explained by the high level of threat involved in the vignettes utilised; that is, they questioned whether fear preponderates anxiety in circumstances that are perceived to be highly threatening.

Subsequently, study two of the Perkins et al. (2010) study aimed to determine the impact of situational factors (i.e., the level of ambiguity, escapability, and magnitude/intensity of the threats, distance from the threat, and opportunity for concealment) on fear reactions to the threatening vignettes (see Table 5.2). The situational factors utilised were developed based upon factors which have been shown to effect rodent behaviour. Participants comprised 106 university students and volunteers, 77% of who were women. Overall, fear was found to be positively associated with defensive direction and the intensity of the threat. Fear was also positively correlated with the perceived distance of the threat, and negatively correlated with escapability and the availability of concealment. Results indicated that highly fearful individuals generally have a magnification of the perception of threat, tending to perceive threat as particularly intense and close. O-BIS was found to be related to defensive direction,
indicating that elevated levels of o-BIS are associated with the tendency to orient away from threat. Moreover, trait anxiety was negatively correlated to perceived escability from threat. Results appear to support the contention that fear becomes the overwhelming emotion in circumstances which are perceived to be particularly threatening. This contention was not evidenced in study one of this thesis as fear did not preponderate anxiety in predicting social anxiety (a condition typified by threat sensitivity due to an overactive FFFS). By measuring threat perception we may provide a greater understanding of these relationships.
Table 5.1

Summary of Threat Response Research with Human Participants

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1. The frequency with which risk assessment is selected will relate positively to the ambiguity of the threat</td>
<td>.89**/.86**</td>
<td>.89**/.85**</td>
<td>Not reported</td>
</tr>
<tr>
<td>2. The frequency with which flight is selected will relate negatively to the ambiguity of the threat</td>
<td>-.50/.63*</td>
<td>-.56/.59*</td>
<td>Not reported</td>
</tr>
<tr>
<td>3. The frequency with which defensive attack is selected will relate negatively to ambiguity of the threat</td>
<td>-.53/.29</td>
<td>-.54/.44</td>
<td>Not reported</td>
</tr>
<tr>
<td>4. The frequency with which flight is selected will relate positively to escapability to the threat</td>
<td>.10/.04</td>
<td>.12/.13</td>
<td>Not reported</td>
</tr>
<tr>
<td>5. The frequency with which defensive attack is selected will relate negatively to the escapability of the threat</td>
<td>-.76*/.65*</td>
<td>-.87**/.89**</td>
<td>Not reported</td>
</tr>
<tr>
<td>6. The frequency with which defensive attack is selected will relate negatively to the distance of the threat</td>
<td>-.59*/.64*</td>
<td>-.62*/.69*</td>
<td>Not reported</td>
</tr>
<tr>
<td>7. The frequency with which hiding is selected will relate positively to the availability of a hiding place</td>
<td>.59*/.63*</td>
<td>.33/.30</td>
<td>Not reported</td>
</tr>
<tr>
<td>8. Flight is most likely in the face of threats that are escapable and clearly dangerous</td>
<td>Suggested p/hoc</td>
<td>$B=-.325$/.414**</td>
<td>Not reported</td>
</tr>
<tr>
<td>9. Fear (FSS) is likely to be positively associated with orientation away from threat</td>
<td>Not measured</td>
<td>.203**</td>
<td>.333**</td>
</tr>
<tr>
<td>10. Anxiety (STAI) is most likely to be associated with orientation towards threat</td>
<td>Not measured</td>
<td>$B=-.206*$</td>
<td>.113</td>
</tr>
<tr>
<td>11. BIS will be positively associated with orientation away from threat</td>
<td>Not measured</td>
<td>.257**</td>
<td>.211**</td>
</tr>
</tbody>
</table>

Note: Males/females.

*p<.05, **p<.01, ***p<.001
Table 5.2

Summary of Situational Factors on Threat Response Perkins et al., 2010

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fear</th>
<th>Anxiety</th>
<th>BIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defensive direction (high=away)</td>
<td>.539**</td>
<td>-.92</td>
<td>.211*</td>
</tr>
<tr>
<td>Defensive intensity (high=intense)</td>
<td>.209*</td>
<td>.119</td>
<td>.095</td>
</tr>
<tr>
<td>Perceived intensity of threat</td>
<td>.389**</td>
<td>.172</td>
<td>.236*</td>
</tr>
<tr>
<td>Perceived escapability of threat</td>
<td>-.337**</td>
<td>-.406**</td>
<td>-.183</td>
</tr>
<tr>
<td>Perceived distance to threat</td>
<td>-.249*</td>
<td>-.143</td>
<td>-.147</td>
</tr>
<tr>
<td>Perceived ambiguity of threat</td>
<td>-.001</td>
<td>.056</td>
<td>.089</td>
</tr>
<tr>
<td>Perceived availability of concealment</td>
<td>-.215*</td>
<td>-.170</td>
<td>.065</td>
</tr>
</tbody>
</table>

Note. N=97, *p<.05, **p<.01.

Summary of Findings From Empirical Evidence

The aforementioned research investigating human defence behaviours offers support for the contention that there are similarities between rodent and human reactions to threatening stimuli (Blanchard, Hynd, et al., 2001; Perkins & Corr, 2006) which are largely consistent with behavioural predictions using r-RST as a theoretical framework (Corr, 2011; Gray & McNaughton, 2000). In general, certain elements of r-RST appear to be associated with defensive direction, particularly fear and o-BIS in motivating orientation away from threat (Perkins, et al., 2010; Perkins & Corr, 2006); and there is partial support for the role of anxiety in motivating appetitive behaviour (Perkins & Corr, 2006). Given anxiety was found to be associated with appetitive movement, it is expected r-BAS is implicated in this relationship; however this has not been empirically tested. Fear appears to be the most salient personality variable associated with defensive direction and intensity; with highly fearful individuals perceiving threats as more
intensive, less escapable, closer, and difficult to conceal the self from. As fear is considered to be the emotional outcome of FFFS activity, it would be expected that this r-RST system would also be related to defensive behaviour; however, this has never been empirically tested. It is clear that future research is required to obtain a clearer understanding of defensive behaviour in humans.

**Defensive Direction and Distance in Understanding Social Anxiety and Alcohol Use**

Elevated defensiveness is a key feature of heightened social anxiety (APA, 2000). Individuals with SAD perceive social situations to be particularly threatening and respond with avoidance, anxious approach behaviours, and defensive freeze; this has been demonstrated in a number of past studies (Coplan, et al., 2006; Kashdan & Roberts, 2006; Kimbrel, et al., 2010) and was partially replicated in study one of the current dissertation. Despite this, no research to date has investigated the role of defensive direction and intensity in understanding social anxiety. Study one of the present research was the first to link r-RST to social anxiety. Findings indicated that fear, anxiety, and FFFS (particularly Freeze) were associated with high levels of social anxiety, and BAS (particularly o-BAS but r-BAS to a lesser extent) played a role in motivating alcohol consumption. These results pose some questions regarding defensive behaviours for those with elevated levels of social anxiety.

In particular, the role of fear and anxiety in understanding defensive behaviours is not well understood. In study one of present research, fear and anxiety were found to be separate constructs, a finding which is congruent with past research (Cooper, et al., 2007; Perkins, et al., 2007). Whilst Blanchard et al. (2001) found fear and anxiety to be related to threatening scenarios, Perkins and
Corr (2006) reported that anxiety was found to have no impact, indicating that perhaps fear preponderates anxiety in highly threatening situations. Perkins et al. (2010) indicated that situational factors such as perceived intensity and proximity of the threat mediate the relationships between fear/anxiety and threat response; however, little is known of how such responses may impact defensive behaviours and how this relates to our understanding of social anxiety.

As mentioned, another element of r-RST which was found to be associated with social anxiety in study one was the FFFS. Whilst fight, flight and freeze differentiated between those with high versus low levels of social anxiety, freeze appeared to be the most important element of this subsystem in understanding both facets of social anxiety measured. Theoretically, one would expect flight to have more of an impact in responding to threat in socially anxious people; particularly as SAD is characterised by avoidant behaviour (APA, 2000). Certainly research from the defensive direction literature suggests that fight may be utilised when the threat is closer in proximity, and flight is initiated when threats are distal (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010). Study one did not investigate the role situational factors such as proximity of threat may play in understanding defensive behaviour in those with elevated levels of social anxiety. Thus, the current study may serve to provide further clarification regarding this.

Finally, whilst aversive motivational models predict that hazardous alcohol use develops in anxious individuals in order to reduce unwanted negative emotionality or symptoms, study one offered support for the contention that socially anxious hazardous drinkers approach alcohol due to a hypersensitive reward system as well as heightened threat detection system. By obtaining an
understanding of defensive direction and threat perception, the relationship between RST, social anxiety and hazardous alcohol use may be more clearly understood. Whilst study one investigated RST in understanding social anxiety and co-morbid hazardous alcohol use, there is a clear void in the literature regarding threat perception and defensive behaviour in relation to understanding this co-morbidity.

**Research Aims**

Thus, a unique aim of this study is to examine the extent to which social anxiety and alcohol use relates to the nature and magnitude of defensive behaviours. Additionally, the study aims to investigate whether trait measures of motivational system functioning (e.g., FFFS) predict threat perception and defensive responses to specific threatening scenarios in individuals with differing levels of social anxiety and alcohol use.

Next, using self report measures of personality variables (e.g., Jackson, 2009; Spielberger, et al., 1983; Wolpe & Lang, 1977) and a vignette designed to measure threat responsiveness (Blanchard, Hynd, et al., 2001), the current study aims to explore the relationships between r-RST, fear, anxiety, and possible mediating situational factors (e.g., perceived ambiguity of threat, perceived distance from threat), in understanding the relationship between trait measures of motivational system functioning and social anxiety.

**Hypotheses**

The hypotheses and results sections pertaining to Study two will be separated into four sections. Each will involve threat perception variables and self reported defensive behaviour (i.e., defensive direction and intensity);
however different elements will be addressed independently in relation to these variables. The first of these will address threat and RST, the second will involve fear, anxiety and threat, the third social anxiety, alcohol use and threat. Finally, an examination of mediator variables will be presented in section four of the results section.

Based on the previous research discussed, it is hypothesised that:

**Section One: RST, Threat Perception and Defensive Behaviour**

1. It is hypothesised that BAS will be positively associated with orientation toward threat;

2. The FFFS in predicting threat perception will be explored to determine which elements of threat perception contribute the most unique variance. Specifically FFFS Fight is predicted to be positively associated with perceived proximity of threat; FFFS Flight is predicted to be negatively associated with perceived proximity of threat; and FFFS Freeze is predicted to be positively associated with proximity of threat and negatively associated with escapability;

3. It is hypothesised that r-BIS will be positively associated with anxiety, orientation towards threat, and perceived level of ambiguity;

**Section Two: Fear, Anxiety, Threat Perception and Defensive Behaviour**

1. It is hypothesised that fear will be positively associated with defensive direction (orientation away from threat), perceived intensity and proximity, and negatively associated with escapability and concealment;
2. It is hypothesised that anxiety (STAI) will negatively correlate with defensive direction (orientation towards threat) and perceived escapability and positively associated with perceived level of threat.

**Section Three: Threat Perception, Defensive Behaviour, Social Anxiety and Alcohol Use**

1. It is hypothesised that social anxiety will be positively associated with orientation away from threat;

2. It is predicted that participants with high levels of social anxiety are more likely to perceive threat as more intense (P-threat), less escapable (P-escape), less availability of concealment (P-conceal), less ambiguous (P-ambiguity) and more proximal (P-distance) when compared to those with low levels off social anxiety;

3. Social anxiety is also hypothesised to be associated with orientation away from threat (high defensive direction) and increased defensive intensity.

4. It is hypothesised that participants with high levels of social anxiety and alcohol use are predicted to report higher levels of FFFS, r-BIS, fear, anxiety, r-BAS, P-threat, and lower levels of defensive direction (orientation towards threat), and P-escape, and P-distance than those with low levels of social anxiety and alcohol use (controls).

**Section Four: Threat Perception as Mediators for the Relationships between Trait Variables and Social Anxiety**

1. Finally, it is predicted that the relationships between trait variables (fear, anxiety, FFFS) and social anxiety is predicted to be mediated by the threat perception variables.
Method

Participants

Participants comprised 218 individuals recruited via an online questionnaire; 55 males (25.5%, age; $M=34.67$, $SD=11.97$) and 160 females (73.4%, age; $M=32.83$, $SD=11.07$). Three participants did not specify their gender. Further demographic information can be found in Table 5.3. As can be seen, the majority of the participants are Australian born, in full time or part time/casual employment, and married/living with a partner. The mean age of the sample is 33.27 ($SD=11.25$), with a range from 18-74 years.
Table 5.3

**Participant Demographics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males (N=55)</th>
<th>Females (N=160)</th>
<th>Total (N= 218)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>5 (9.1%)</td>
<td>5 (3.1%)</td>
<td>10 (4.6%)</td>
</tr>
<tr>
<td>Employed casually/PT</td>
<td>12 (21.8%)</td>
<td>35 (21.9%)</td>
<td>48 (22.2%) b</td>
</tr>
<tr>
<td>Employed FT</td>
<td>30 (54.5%)</td>
<td>84 (52.5%)</td>
<td>116 (53.2%) b</td>
</tr>
<tr>
<td>Self employed</td>
<td>1 (1.8%)</td>
<td>4 (2.5%)</td>
<td>5 (2.4%)</td>
</tr>
<tr>
<td>Student a</td>
<td>6 (10.9%)</td>
<td>16 (10 %)</td>
<td>22 (10.2%)</td>
</tr>
<tr>
<td>Pensioner/retiree</td>
<td>2 (3.6%)</td>
<td>6 (3.7%)</td>
<td>8 (3.7%)</td>
</tr>
<tr>
<td>Stay at home parent/maternity leave</td>
<td>-</td>
<td>6 (3.7%)</td>
<td>6 (2.9%)</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>5 (3%)</td>
<td>5 (2.5%)</td>
</tr>
</tbody>
</table>

| Relationship status                     |              |                 |                |
| Single                                  | 15 (27.3%)   | 38 (23.8%)      | 53 (24.3%)     |
| Casual partner                          | 3 (5.5%)     | 1 (.6%)         | 4 (1.8%)       |
| Steady partner                          | 6 (10.9%)    | 33 (20.6%)      | 40 (18.3%) b   |
| Married/ living with a partner           | 28 (50.9%)   | 78 (48.8%)      | 108 (49.5%) b  |
| Separated/divorced                      | 2 (3.6%)     | 9 (5.6%)        | 11 (5%)        |
| Widowed                                 | -            | 1 (.6%)         | 1 (.5%)        |

| Country of birth                        |              |                 |                |
| Australia                               | 43 (78.2%)   | 131 (81.9%)     | 176 (80.7%) b  |
| England/UK                              | 4 (7.2%)     | 13 (8.1%)       | 17 (7.9%)      |
| USA                                     | -            | 4 (2.6%)        | 4 (1.8%)       |
| South Africa                            | 2 (3.6%)     | 4 (2.6%)        | 6 (2.7%)       |
| Canada                                  | -            | 2 (1.3%)        | 2 (.9%)        |
| New Zealand                             | 1 (1.8%)     | 1 (.6%)         | 2 (.9%)        |
| India                                   | 1 (1.8%)     | -               | 2 (.9%) b      |
| Other                                   | 4 (7.2%)     | 3 (1.8 %)       | 7 (3.5%)       |

*Note.* PT= part time, FT= full time. Not all participants disclosed all demographic information. a Includes students with p/t or casual work. b Total is inclusive of individuals who did not provide gender information.
Measures

**Threat scenarios.** Vignettes are commonly used to study situations which are difficult or unethical to produce (Blanchard, Hynd, et al., 2001; O’Connor, Archer, & Wu, 2001; Perkins, et al., 2010; Perkins & Corr, 2006). They have been found in various studies to evoke emotional responses from participants which could not otherwise be ethically elicited (e.g., Blanchard & Blanchard, 1984; O’Connor, et al., 2001). Researchers have developed 12 brief scenarios to measure defensive reactions to threatening situations (see Table 5.4) designed to vary in levels of danger, escapability, ambiguity of the threatening stimuli, availability of protection or concealment, and distance from the threat (Blanchard, Hynd, et al., 2001). Participants rate each scenario on a scale of 1 (e.g., not threatening) through to 7 (e.g., highly threatening). Perkins and Corr (2006) developed a coding mechanism for each of the 12 vignettes in order to derive continuous scores for defensive intensity (see Figure 5.1). The ratings were in accordance with findings from those developed from observing rodents when faced with real threat.
Figure 5.1. Threat scenario response choices coded for defensive direction and intensity. Numbers on the left represent intensity ratings for the corresponding boxes to the right. The higher the number, the higher the level of intensity in response to threat. Numbers on the bottom of the diagram represent defensive direction, ranging from one representing orientation towards threat to two indicating orientation away from threat. Adapted from "Reactions to threat and personality: Psychometric differentiation of intensity and direction dimensions of human defensive behaviour" by A.M. Perkins and P.J. Corr, 2006, *Behavioural Brain Research*, 169, p. 23.

Codes for defensive direction are assigned (Perkins & Corr, 2006).

Reactions which involve orientation towards the threat are assigned a one and reactions which motivate orientation away from threat are given the value of two.

As the freeze response requires no movement, a neutral score of 1.5 was assigned.

Defensive intensity codes are also derived according to the distances identified as eliciting rodent defences to real threats with defensive behaviours.
reflecting closer proximity "attack, yell/scream" receiving a higher code (three) than behaviours which reflect less intensity such as those which occur when the threat is further away such as "run/hide" (one) (Perkins & Corr, 2006).

In accordance with Perkins and Corr's (2006) scoring system, overall scores were derived by totalling defensive intensity and direction scores, with higher scores on defensive intensity representing a greater tendency to respond with intensity and higher defensive direction scores indicating a greater tendency to navigate away from threat.

**Personality Questionnaires**

**Social anxiety – Social Interaction Anxiety Scale (SIAS) and the Social Phobia Scale (SPS) (Mattick & Clarke, 1998).** The SIAS is a 19 item measure of social interaction anxiety and the SPS a 20 item measure of fear related to scrutiny by others. These scales are typically administered together and utilised as a holistic measure of social anxiety, however are also validated to be administered as individual measures. Items are scored on a five point Likert scale ranging from zero (not at all characteristic or true of me) to four (extremely characteristic or true of me); two items are reverse scored. Examples of SIAS items include "am tense mixing in a group" and "When mixing socially I am uncomfortable". Examples of SPS items include "fear I may blush when I am with others" and "can feel conspicuous standing in a queue". The SPS and SIAS has been demonstrated to have strong internal consistency in community, clinical, and undergraduate samples (SPS, $\alpha=0.89-0.94$; SIAS, $\alpha=0.88-0.93$) and have good test-retest reliability (SPS $r=0.93$, SIAS $r=0.92$ at 13 weeks). Both measures have been found to discriminate among individuals with anxiety disorders and between
those with social anxiety and controls (Mattick & Clarke, 1998; Mattick, et al., 1989).

**Alcohol Use – The Alcohol Use Disorders Identification Test (AUDIT; Saunders, et al., 1993).** The AUDIT is a widely used measure of alcohol use which assesses the frequency and quantity of alcohol consumption (e.g., How often do you have a drink containing alcohol?), alcohol related problems (e.g., Have you or someone else been injured as a result of your drinking?), dependence symptoms (e.g., How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?) and binge drinking episodes (e.g., How often do you have six or more drinks on one occasion?). It has very good internal consistency (α=0.80-0.94) and test-retest reliability (r=0.88 over six weeks). Scores on this 10 item measure can range from 0-40 with a score over ten indicative of potentially hazardous drinking.

**Revised RST - Jackson 5: Scales for measuring the Revised Reinforcement Sensitivity Theory (Jackson, 2009).** The newly developed Jackson 5 measure was designed specifically to quantify levels of r-RST constructs. It comprises three higher order scales subscales (r-BIS, r-BAS, and FFFS) and the FFFS primary scales (r-Fight, r-Flight, and r-Freeze). The Jackson 5 contains 30 statements, six items to reflect each subsystem; for example, r-BIS (e.g., →want to avoid looking bad”), r-BAS (e.g., →look for new sensations”), r-Fight (e.g., →would fight back if someone hit me first”), r-Flight (e.g., →If a dog barks at me, I would run away”), and r-Freeze (e.g., →If I got scared in my bed at night, I would remain motionless”). It has adequate internal consistency (α=0.70-0.83) and has demonstrated appropriate convergent and discriminant validity with commonly utilised personality measures such as the Eysenck’s Personality
Questionnaire (Eysenck & Eysenck, 1991), Dickman’s impulsivity constructs (Dickman, 1990), and Costa and McCrae’s Neuroticism Extraversion Openness questionnaire (Costa & McCrae, 1992).

**Trait anxiety - State Trait Anxiety Inventory (STAI) Form Y-2** *(Spielberger, et al., 1983).* Trait anxiety was measured using trait subscale of the STAI (STAI-T). This measure was used to assess the tendency to experience anxiety in adverse situations (Spielberger, et al., 1983). This measure comprises 20 statements and requires participants to reflect upon how they — generally feel” on a scale from one (almost never) to four (almost always). Items include — feel secure”, — feel pleasant” (reverse coded), and — feel inadequate”. The STAI-T has excellent internal reliability ($\alpha=0.86-0.92$) and has been shown to have good test-retest reliability over 104 days ($r=0.77$).

**Trait Fearfulness - Fear Survey Schedule III (FSS)** *(Wolpe & Lang, 1977).* The FSS is considered the most established valid and reliable measure of fear (Oei, et al., 1987) with reports of Cronbach alphas ranging up to 0.97 (Perkins, et al., 2007). A number of versions of this scale have been developed (e.g., Wolpe & Lang, 1964;1977) ranging in length from 8-108 items. The present study used the most recent version of the FSS (Wolpe & Lang, 1977), comprising 108 items of potentially aversive stimuli such as —thunder” and —loud voices”. Participants were asked to reflect on how —disturbed” they felt by the items on a five point scale from zero (not at all) to four (very much).

In accordance with Klieger and McCoy’s (1994) recommendations for improving the concurrent validity of the FSS, an example item was provided containing explicit descriptions for each of the ratings. For example, the item
harmless snakes” was provided following the questionnaire instructions with a list of the behavioural indicators representative of each rating including zero—no at all. I may feel disgusted but I am not at all nervous or fearful when I see a harmless snake at the zoo” and four – “Very much – I feel very afraid, I run away, pass out when I see a harmless snake at the zoo.” Such descriptors use the example ratings to highlight that responses must be indicative of fear to leverage a rating for an item rather than other emotional responses such as disgust. Research has demonstrated that this technique reduces the number of false positives endorsed thus given a purer measure of fear (Klieger & McCoy, 1994).

Some items of this measure have been criticised for their use with the general public as they may be deemed as embarrassing or inappropriate (see Cooper, et al., 2007; Perkins, et al., 2007); subsequently, six items of this nature (“people who seem insane”, “ugly people”, “crippled or deformed people”, “becoming sexually aroused”, “ideas of possible homosexuality”, and “masturbation”) were excluded from use in the present study. One hundred and two of the original items were retained. Results from Study one of this thesis indicated very high internal consistency across the 102 items (\(r=.86\)).

**Original RST - Sensitivity to Punishment and Sensitivity to Reward Scale (SPSRQ) (Torrubia, et al., 2001).** The SPSRQ was designed to specifically assess appetitive (BAS) and aversive (BIS) motivational system functioning as specified by the original conceptualisation of RST. A short version of the SPSRQ has been developed which demonstrated improved factor structure and item properties when compared to the original 48 item measure (O’Conner, et al., 2004). This questionnaire comprises 35 yes/no items, 18 of which measure sensitivity to punishment (SP), and 17 dedicated to measure sensitivity to
rewarding (SR) stimuli. Endorsed items were assigned a value of one whilst non endorsed items were allocated a score of zero. Both scales demonstrate acceptable levels of internal consistency (SP, $\alpha=0.84 - 0.85$; SR, $\alpha=0.70-0.82$) and test-retest reliability (three months; SP, $r=0.89$; SR, $r=0.87$) (Cooper & Gomez, 2008; Ibáñez, et al., 2010; O'Conner, et al., 2004). These two scales were considered to be theoretically capturing these constructs as evidenced by appropriate associations with other motivational traits such as extraversion, neuroticism, anxiety and sensation-seeking (see Cooper & Gomez, 2008; Torrubia, et al., 2001).
Table 5.4

*Defensive Threat Vignettes Developed by Blanchard et al. (2001)*

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>You are walking along in an isolated but familiar area when a menacing stranger suddenly jumps out of the bushes to attack you.</td>
</tr>
<tr>
<td>2.</td>
<td>You are alone in an elevator late at night. As it stops and the doors open, a menacing stranger rushes in to attack you, blocking the door.</td>
</tr>
<tr>
<td>3.</td>
<td>You are alone in a car on your way home. While stopped at a traffic signal, an angry stranger begins banging on your car window and yelling threatening things at you.</td>
</tr>
<tr>
<td>4.</td>
<td>Driving along a two-lane road, you see in your rear-view mirror that a car is dangerously tailgating you. They cannot pass and begin honking their horn aggressively at you while continuing to follow too closely.</td>
</tr>
<tr>
<td>5.</td>
<td>It is past midnight and you are walking through an unfamiliar part of town. As you round a corner, you accidently run into a man. He becomes angry and shoves you.</td>
</tr>
<tr>
<td>6.</td>
<td>You and someone you do not really know that well are standing around and talking in an empty parking lot. The acquaintance begins to shove and push you. You are unsure whether s/he (same sex as you) is serious or just kidding around.</td>
</tr>
<tr>
<td>7.</td>
<td>You are outside in a park area at night when you see a menacing stranger with a knife about 30ft (about 9 metres) away directly approaching you. It is obvious the person is planning to attack you.</td>
</tr>
<tr>
<td>8.</td>
<td>You are alone as you exit an empty campus building late one night. Just as you get outside, you feel a hand grab your arm.</td>
</tr>
<tr>
<td>9.</td>
<td>You are sleeping in bed during the night, but suddenly wake up thinking you have heard a suspicious noise. It is dark and you are alone.</td>
</tr>
</tbody>
</table>
Table 5.4 (cont)

Defensive Threat Vignettes Developed by Blanchard et al. (2001).

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>You are alone at home one night about to go to bed when the phone rings. You answer it, and there is an unfamiliar voice on the other end. It tells you that they are right outside your house and hangs up.</td>
</tr>
<tr>
<td>11.</td>
<td>Coming home one day, you find an unexpected shoe-box-sized package waiting for you by the mailbox. As you sit down to open it, you notice a faint ticking sound that appears to come from inside the package.</td>
</tr>
<tr>
<td>12.</td>
<td>Alone at home one night, you have settled down to read a book when you hear some movement right outside of your window. You cannot see anything, but when you listen more closely, it sounds like people whispering.</td>
</tr>
</tbody>
</table>
Procedure

Participants completed an online questionnaire which took approximately 25-30 minutes to finalise and was preceded by a plain language statement which clearly outlined the purpose of the study, anonymity of responses, and any risks or potential benefits of participation (see appendix D). It was distributed via a number of online platforms such as Australian advertising forums, social networking sites, and through the snowballing technique.

Participants completed demographic questions before being asked to complete the vignettes. In accordance with previous research, participants were asked to read each scenario and rate their perceptions on a 7-point scale according to the magnitude or intensity of the threat, escapability, distance between themselves and the threatening stimuli, ambiguity of the threat, and opportunity for concealment (Perkins, et al., 2010).

Following this, they were then asked to choose their initial response from a list of 10 defensive behaviours. These were 1) hide, 2) freeze, become immobilised 3), run away, try to escape, remove self, 4) threaten to scream or call for help, 5) yell, scream, or call for help, 6) threaten to attack, 7) attack or struggle, 8) check out, approach or investigate, 9) look for something to use as a weapon, 10) beg, please for mercy, or negotiate (Blanchard, Hynd, et al., 2001).

In accordance with previous studies, the threat scenarios were scored to measure defensive distance and intensity (see Figure 5.1) (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010; Perkins & Corr, 2006). Defensive intensity codes were originally derived from behaviour seen in rodents (e.g., flight is typically seen with greater defensive distance than is defensive fight) with the exception of
three behaviours not performed by animals (threaten to scream, look for a weapon, and beg-plead-negotiate) which were estimated (Blanchard, Hynd, et al., 2001). For example, 'attack, yell, scream' was assigned an intensity rating of three however a threat to scream or attack were assigned a rating of one. Defensive reactions which were oriented away from threat were assigned a rating of two, whereas reactions orientation toward threat were assigned a defensive direction rating of one. Freeze was given a neutral score of 1.5.

Defensive direction and intensity codes were totalled with higher scores on defensive direction representing an orientation away from threat and elevated scores on defensive intensity represented the tendency to respond with intensity (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010).

Results

Preliminary Data Analysis

Preliminary data analyses were conducted on all measures. Missing values analysis was conducted and any cases with more than 5% missing data were deleted and any other data missing at random were replaced with the item mean (Tabachnick & Fidell, 2007).

Variables were examined for univariate and multivariate outliers and for deviations from normality. In accordance with Tabachnick and Fidell (2007) extreme cases, those with standardised scores exceeding 3.29, were considered univariate outliers. Cases containing univariate outliers that were above this criterion found in the P-escape, AUDIT, SIAS, SPS, social anxiety total scale, r-BAS, r-BIS, Freeze, FFFS and FSS were re-coded by assigning the outlying cases a raw score on the relevant variable one unit larger or smaller than the most
extreme score which is within 3.29 standard deviations from the mean (Tabachnick & Fidell, 2007). Using the \( p < .001 \) criterion (Tabachnick & Fidell, 2007) all variables were assessed for multivariate outliers; however, social anxiety total was excluded from the regression as it was highly correlated with social interaction anxiety. Mahalanobis distance reported three multivariate outliers which were higher than the critical value \( (\chi^2 = 45.3, df=20, p < .001) \). Consequently, these outliers were deleted from the dataset.

Investigation of Shapiro-Wilks statistics indicate violations of normality; however, such statistics are highly sensitive with larger sample sizes. Further, with large sample sizes violations in skewness and kurtosis have little impact upon analyses (Tabachnick & Fidell, 2007). Absolute skewness and kurtosis statistics indicate that there were no severe violations of distribution (see Table 5.5). Given these factors, data transformation was not performed. This decision was based on recommendations from Tabachnick and Fidell who report that transformation of theoretically important variables can lead to difficulty with the interpretation of data. In sum, all variables utilised in the following analyses have distributions indicative of the general populations and contain no univariate or multivariate outliers \( (p < .001) \).
Table 5.5

*Skewness and Kurtosis Indices for all Measures*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Skewness (SE=.17)</th>
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<td>P-concealment</td>
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<td>-.40</td>
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</table>
Summary Statistics

Means, standard deviations and internal consistency data for the variables are presented in Table 5.6. As shown, with the exception of the FFFS and r-BIS scales, all measures have acceptable to very high internal consistency. Alpha levels for the FFFS and r-BIS scales were slightly lower than those reported by Jackson (2009) which ranged from 0.69-0.74. Reliabilities for defensive direction and intensity scores were low (Pallant, 2007); however, slightly better than that reported by Perkins et al. (2010) which were 0.48 for defensive direction and 0.45 for defensive intensity. Given the nature of these scales, high internal consistencies as assessed by the Cronbach Alpha are not to be expected. There are two reasons for this: Firstly, the defensive direction and defensive intensity scales used are comprised of a small number of items, and secondly, as can be seen in Figure 5.1, there are a larger amount of options associated with orientation towards threat and responses that are low in intensity. Both of these issues may have subsequently affected the reliability estimates for these two variables.
Table 5.6

*Descriptive Statistics and Reliability Coefficients for Personality Questionnaires*

<table>
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*Note.* Equal variances not assumed for AUDIT and SPS.

*p<.05, **p<.01, ***p<.001.
Section One: RST, Threat Perception and Defensive Behaviour

Intercorrelations

Initial bivariate correlational analyses were conducted to investigate the relationships among the RST, threat perception, and defensive behaviour variables. As can be seen in Table 5.7, Pearson’s correlation coefficients indicated that there were weak albeit significant negative correlations between r-BAS and Fight and defensive direction indicating with increased r-BAS and Fight there was a tendency for orientation towards threat. There was also a weak negative correlation between r-BAS and Freeze indicating that as r-BAS levels increase levels of RST Freeze decreases.

There were also weak significant positive correlations between Flight and Freeze and defensive direction. One RST variable, Flight, displayed a weak significant relationship with defensive intensity.

Results also indicated a weak significant positive relationship between r-BIS and perceived level of ambiguity in the threat scenarios. The same relationship was not found with o-BIS. There were weak positive correlations between Flight, Freeze and perceived level of threat. There was also moderate strength negative relationship between Freeze and perceived level of escapability and a weak positive association with concealment from threat. A weak positive significant relationship between o-BIS and perceived level of threat and a moderate significant negatively relationship between o-BIS and escapability was also observed.
Table 5.7

*Correlations for RST variables, Fear, Anxiety, Defensive Direction and Defensive Behaviours*

<table>
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<tr>
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Table 5.7 (cont)

*Correlations for RST variables, Fear, Anxiety, Defensive Direction and Defensive Behaviours*

<table>
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<td>.07</td>
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<td>.47***</td>
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</tbody>
</table>

*Note. DD=Defensive direction, DI=Defensive Intensity.*

*p<.05, **p<.01, ***p<.001.*
BAS and Orientation Towards Threat

In order to test the hypothesis that BAS would be negatively associated with defensive direction, indicating orientation towards threat, bivariate correlational analyses were conducted. As can be seen in Table 5.7, there was a weak yet significant negative correlation between r-BAS and defensive direction. O-BAS was not significantly correlated with defensive direction.

FFFS and Threat Perception

In order to explore the role of the FFFS in predicting threat perception variables, five multiple regressions were performed. These investigated Fight, Flight and Freeze in predicting perceived level of threat (P-threat), Perceived level of escapability (P-escape), perceived distance from threat (P-distance), perceived level of ambiguity of threat (P-ambiguity), and perceived level of concealment from threat (P-concealment). These will be discussed in succession below.

The first of these analyses was performed to test whether the Fight, Flight, and Freeze subscales predict P-threat. Overall, Fight, Flight and Freeze accounted for 7.8% of the variance in P-threat ($F(3, 213)=6.04, p=.001$; see Table 5.8) Specifically, Flight ($r(3, 213)= 2.63, p=.009$) and Freeze ($r(3, 213)= 2.41, p=.012$) were found to be a significant predictors of P-threat.
Table 5.8

*Standard Multiple Regression Analyses of Fight, Flight, and Freeze in Predicting P-threat*

<table>
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<th></th>
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<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>Zero-order</th>
<th>sr²</th>
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<td>.017</td>
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<td>.02</td>
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</table>

The next standard multiple regression examined Fight, Flight and Freeze in predicting P-escape. To do this, Fight, Flight, and Freeze subscales were entered into the analyses to examine their individual relationships with P-escape. Overall, Fight, Flight and Freeze accounted for 9.9% of the unique variance in P-escape ($F(3, 213)=7.85, p<.001$). As can be seen in Table 5.9, Freeze was the only variable to significantly predict P-escape accounting for 9% of the unique variance in P-escape ($t(3, 213)= -4.55, p<.001$).
Table 5.9

*Standard Multiple Regression Analyses of Fight, Flight, and Freeze in Predicting P-escape*

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
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<th>$sr^2$</th>
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<td>.09</td>
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</table>

Further analyses were undertaken to obtain a clearer understanding of the role of Fight, Flight and Freeze in predicting P-distance. Overall, the three independent variables did not significantly contribute to the prediction of P-distance, $F(3, 213)=.37, p=.775$. Similar findings were found when multiple regressions were run to investigate Fight, Flight and Freeze in predicting P-ambiguity ($F(3, 213)=1.84, p=.140$), and P-concealment ($F(3, 213)=1.64, p=.181$).

**R-BIS, Anxiety, Threat Perception and Defensive Behaviour**

It was hypothesised that r-BIS would be positively correlated with anxiety, perceived level of ambiguity and negatively correlated with defensive distance indicating orientation towards threat. As can be seen in Table 5.7, there were no significant relationships between r-BIS and anxiety or defensive direction. There was, however, a weak yet significant relationship between r-BIS and perceived level of ambiguity which is in line with revisions to RST.
Section Two: Fear and Anxiety, Threat Perception and Defensive Behaviour

Intercorrelations

Bivariate correlational analyses were conducted to investigate the relationships among fear, anxiety, threat perception and defensive behaviour variables. Results of this analysis can be seen in Table 5.10. Table 5.10 includes correlations reported in an earlier analysis (Table 5.7); however the following analysis also reports on associations with fear for the purposes of this section.

Fear as a Predictor of Threat Intensity and Perceived Threat Variables

It was hypothesised that fear would be associated with defensive direction (orientation away from threat), increased defensive intensity, perceived level of threat (P-threat), the perception of threat as less escapable (P-escapability), and greater availability of concealment (P-concealment). Pearson’s correlation coefficients partially supported this hypothesis (see Table 5.10). There was a weak significant relationship between fear and orientation away from threat and fear and perceived level of threat (high scores of the latter indicating increasing levels of threat). There was also a weak yet significant negative correlation between fear and perceived escapability from threat. Fear was not significantly correlated with P-concealment as was predicted.

Anxiety, Defensive Direction and Perceived Level of Escapability from Threat

It was also hypothesised that trait anxiety would be negatively correlated with defensive direction (orientation toward threat), and P-escapability and positively associated with P-threat. As can be seen in Table 5.10, results indicate that there was a weak positive association between trait anxiety and P-threat and a
weak negative correlation with perceived escapability. Anxiety was not associated with defensive direction as was hypothesised.

Fear, Anxiety, and Defensive Direction

Pearson's correlation coefficients supported the contention that fear would be positively associated with orientation away from threat. As shown in Table 5.10 there was a weak positive correlation between fear and defensive direction.

As can be seen in Table 5.10, there was no significant relationship between fear or anxiety and defensive intensity, perceived ambiguity, distance and concealment from threat. There was a moderate significant correlation between fear and anxiety.
Table 5.10

*Pearson’s Correlation Coefficients for Fear, Trait Anxiety, Threat Perception and Defensive Behaviours*

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<td>7. P-distance</td>
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<td>-.04</td>
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<td>-.35***</td>
<td>.51***</td>
<td>.47***</td>
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</tbody>
</table>

*Note. *p*<.05, **p*<.01, ***p*<.001.*
Section Three: Threat Perception, Defensive Behaviour, Social Anxiety and Alcohol Use

Intercorrelations

Bivariate correlational analysis was conducted to investigate the relationships between social anxiety, alcohol use, threat perception, and defensive responses. As shown in Table 5.11, there were weak to moderate positive correlations between alcohol use, social interaction anxiety and social performance anxiety. Alcohol use was not associated with defensive direction; however, there was a weak significant negative correlation between alcohol use and defensive intensity. Interestingly there was a weak yet significant relationship between alcohol use and perceived level of ambiguity in threat.

Incongruent with the hypothesis that social anxiety would be positively associated with defensive direction (orientation away from threat), there was no significant relationship between social anxiety (total) and defensive direction. Social interaction anxiety and social performance anxiety were not significantly correlated with defensive distance or intensity. Both of these variables were positively correlated with perceived level of threat and negatively correlated with perceived level of escapability from threat; all of these relationships were weak in strength.
Table 5.11

Correlations for Social Anxiety, Alcohol use, Defensive Direction and Defensive Behaviour

<table>
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<tr>
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<th>4.</th>
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<td>.20**</td>
<td>.19**</td>
<td>.24***</td>
<td>.35***</td>
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<td>-.25***</td>
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<td>-.06</td>
<td>-.09</td>
<td>-.04</td>
<td>-.22**</td>
<td>-.48***</td>
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<td>10. P-ambiguity</td>
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<td>-.18**</td>
<td>-.35***</td>
<td>.51***</td>
<td>.47***</td>
<td>-.00</td>
</tr>
</tbody>
</table>

Note. *p<.05, **p<.01, ***p<.001.
Group Analysis Investigating High and Low Levels of Social Anxiety

For the purpose of the following assessments, cut offs were used to separate data into high and low levels of social anxiety. Established cut-off scores representing clinical levels of social anxiety (e.g., SIAS >=36, SPS >=26; Peters, 2000) were not used due to the discrepancy this caused in cell sizes (high social anxiety = N=24, low social anxiety = N=194), and because this study was designed to assess higher levels of social anxiety in the general population rather than levels indicative of someone who may qualify for a DSM diagnosis of social anxiety disorder. A median split of this data was also problematic as the median of this sample were considered to be at an unacceptably low level to be representative of high and low levels of social anxiety (SA total Mdn=23, SIAS Mdn= 14, SPS Mdn= 9). Given this, an alternative procedure was employed to separate the data by examining the frequency of scores to establish points on the distribution which may separate high and low levels of each variable.

Investigation of distribution plots demonstrated that the distribution for SA total, the SIAS, and SPS appeared to tail off near the top 20% of the distribution. This indicates that individuals in the top 20% of the sample appeared to represent a distinct group of individuals with elevated levels of social anxiety. Based on these distributions, it was determined that cut-off scores of 44 for SA total, 27 for SIAS, and 18 for SPS were appropriate. Cut-off values were similar to those utilised in study one, in which a SA total cut off of 44.92 was derived after examination of the distribution of scores.

A one-way between-groups multivariate analysis of variance (MANOVA) was performed in order to test the hypothesis that those with higher levels of social anxiety are more likely to perceive threat as more intensive (defensive
intensity), more threatening (P-threat), less escapable (P-escape), and more proximal (P-distance) when compared to those with lower levels of social anxiety (total).

Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance matrices, and multicollinearity (Box’s M=5.19, $F(10, 29123.79)=.57, p=.839$) with no serious violations noted.

Results indicated a significant difference between participants with high versus low social anxiety ($F(4, 213)=3.42$, Wilk’s Lambda=.94, $p=.010$; partial $\eta^2 = .06$). Means and standard deviations can be seen in Table 5.12. Specifically, when compared with lower levels, participants with high levels of social anxiety (total) were found to perceive threat as less escapable (P-escape: $F(1, 216)=11.21$, $p=.001$, partial $\eta^2 = .05$) and more threatening (P-threat: $F(1, 216)=8.85$, $p=.003$, partial $\eta^2 = .04$). There was no significant difference between groups for defensive intensity ($F(1, 216)=.94$, $p=.729$, partial $\eta^2 = .00$) or P-distance ($F(1, 216)=3.22$, $p=.074$, partial $\eta^2 = .02$).

Two more one-way between groups MANOVAs were conducted to investigate social interaction anxiety and social performance anxiety separately. The analysis investigating SIAS indicated that there was a significant difference in the combined dependent variables between participants with high versus low levels of social interaction anxiety ($F(4, 213)=4.07$, $p=.003$; Wilk’s Lambda=.93; partial $\eta^2 = .07$). Univariate tests indicated that participants who reported high levels of SIAS were found to have significantly lower levels of P-escapability ($F(1, 216)=14.12$, $p<.001$, partial $\eta^2 = .06$), and higher levels of P-threat ($F(1, 216)=10.42$, $p=.001$, partial $\eta^2 = .05$) and P-distance $F(1, 216)=5.16, p=.024$, and
partial $\eta^2 = .02$) when compared with participants with low levels of SIAS. There was no significant difference between groups for defensive intensity ($F(1, 216) = .97, p = .325$, partial $\eta^2 = .00$).

The final MANOVA examined differences between high and low social performance anxiety on levels of defensive intensity, P-escapability, P-threat, and P-distance. The analysis revealed no significant differences between the groups on any of the dependent variables ($F(4, 216) = 2.07, p = .086$; Wilks' Lambda = 2.07; partial $\eta^2 = .04$).
Table 5.12

*Means and Standard Deviations for Defensive Intensity and Perception of Threat Variables for High and Low Levels of Social Anxiety (Total and Subgroups)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>High SA (N=45)</th>
<th>Low SA (N=173)</th>
<th>High SIAS (N=44)</th>
<th>Low SIAS (N=174)</th>
<th>High SPS (N=48)</th>
<th>Low SPS (N=170)</th>
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<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Defensive intensity</td>
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<td>21.73</td>
<td>2.69</td>
<td>22.13</td>
<td>3.05</td>
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<tr>
<td>P-escapability</td>
<td>50.91</td>
<td>10.59</td>
<td>56.18**</td>
<td>9.07</td>
<td>50.36</td>
<td>10.75</td>
</tr>
<tr>
<td>P-distance</td>
<td>34.19</td>
<td>9.73</td>
<td>37.06</td>
<td>9.47</td>
<td>33.56</td>
<td>8.91</td>
</tr>
<tr>
<td>P-threat</td>
<td>65.77</td>
<td>8.38</td>
<td>61.41**</td>
<td>8.86</td>
<td>66.12</td>
<td>8.04</td>
</tr>
</tbody>
</table>

*Note. Asterisks refer to significant differences between high and low levels of social anxiety (total, SIAS, SPS).*

*p<.05, **p<.01, ***p<.001.*
Social Anxiety, Alcohol Use, R-RST and Defensive Behaviour

A one-way between-groups MANOVA was performed to investigate the hypotheses that those with high levels of social anxiety and alcohol use would report significantly higher levels of P-threat and defensive intensity and lower levels of defensive direction, P-escape, P-concealment, P-ambiguity and P-distance. Group differences in FFFS, fear, r-BIS, anxiety, r-BAS were also investigated.

Participants were divided into four groups according to their levels of social anxiety (high, low) and alcohol use (high, low). Social anxiety groups were retained from the aforementioned analyses (High SA>=44, Low SA<44). A cut-off of eight on the AUDIT was used, as this has repeatedly been demonstrated to show good sensitivity and specificity at detecting levels of hazardous drinking in the general population in a number of samples (e.g., Conigrave, et al., 1995; Saunders, et al., 1993; Selin, 2006).

Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance matrices, and multicolinearity, with no serious violations noted.

Results indicated that there was a significant difference between the four groups on levels of r-RST, threat perception and defensive behaviour ($F(3, 214)=4.17, p=.000; \text{Wilks' Lambda}=.52; \text{partial } \eta^2 = .197$). Means and standard deviations can be found in Table 5.13.
Table 5.13

*Means and Standard Deviations for R-RST, Threat Perception, and Defensive Behaviour in Social Anxiety (Total) and Alcohol Groups*

<table>
<thead>
<tr>
<th>Variables</th>
<th>High SA &amp; AUDIT (N=25)</th>
<th>Low SA &amp; AUDIT (N=107)</th>
<th>High SA &amp; low AUDIT (N=20)</th>
<th>Low SA &amp; high AUDIT (N=66)</th>
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</thead>
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<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>FFFS</td>
<td>52.93</td>
<td>4.69</td>
<td>47.86</td>
<td>6.24</td>
</tr>
<tr>
<td>r-BIS</td>
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<td>r-BAS</td>
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<td>41.11</td>
<td>63.10</td>
<td>40.00</td>
</tr>
<tr>
<td>STAI</td>
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<td>37.95</td>
<td>8.60</td>
</tr>
<tr>
<td>P-threat</td>
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<td>7.46</td>
<td>62.77</td>
<td>8.63</td>
</tr>
<tr>
<td>P-escapability</td>
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<td>9.16</td>
<td>55.72</td>
<td>9.47</td>
</tr>
<tr>
<td>P-distance</td>
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<td>36.76</td>
<td>9.83</td>
</tr>
<tr>
<td>P-ambiguity</td>
<td>48.45</td>
<td>9.84</td>
<td>42.11</td>
<td>12.37</td>
</tr>
<tr>
<td>P-concealment</td>
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<td>10.46</td>
<td>46.09</td>
<td>10.53</td>
</tr>
<tr>
<td>Defensive direction</td>
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<td>2.09</td>
<td>17.01</td>
<td>1.98</td>
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<tr>
<td>Defensive intensity</td>
<td>21.88</td>
<td>3.68</td>
<td>21.92</td>
<td>2.91</td>
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</table>

*Note.* Subscript data represents significant differences between dependent variables of at least *p*<.05 (e.g., groups with different subscripts significantly differed from one another).
Specifically there were significant differences between the four groups for FFFS ($F(3, 213) = 5.46, p = .001$, partial $\eta^2 = .98$), r-BAS ($F(3, 213) = 6.72, p = .000$, partial $\eta^2 = .09$), fear ($F(3, 214) = 21.69, p = .000$, partial $\eta^2 = .23$), anxiety ($F(3, 213) = 34.97, p = .000$, partial $\eta^2 = .33$), P-escape ($F(3, 213) = 4.45, p = .001$, partial $\eta^2 = .06$) and P-threat ($F(3, 213) = 5.50, p = .001$, partial $\eta^2 = .07$). There was no significant differences across groups for r-BIS ($F(3, 213) = .67, p = .571$, partial $\eta^2 = .01$), P-distance ($F(3, 213) = 1.17, p = .32$, partial $\eta^2 = .02$), P-ambiguity ($F(3, 213) = 2.61, p = .053$, partial $\eta^2 = .04$), P-concealment ($F(3, 213) = 1.28, p = .284$, partial $\eta^2 = .02$), defensive intensity ($F(3, 213) = .48, p = .698$, partial $\eta^2 = .01$), or defensive direction ($F(3, 213) = .89, p = .447$, partial $\eta^2 = .01$). Planned comparisons indicated that FFFS, fear, anxiety were significantly higher and P-escape significantly lower in the high social anxiety/hazardous drinkers group when compared to controls. The difference between the high social anxiety/hazardous drinkers and controls for P-threat only approached significance ($M\ diff = 3.78, p = .051$). Finally, r-BAS was significantly higher in controls when compared to high social anxiety/hazardous alcohol use.

R-RST, defensive behaviour and threat perception was also investigated in those with elevated levels of social performance anxiety/hazardous drinkers and social interaction anxiety/hazardous drinkers independently to determine whether there were differences in the way they perceive and respond to threats. Cut offs were retained from prior analyses (AUDIT=>8, S1AS=>27, SPS=>18).

Another MANOVA was performed to investigate r-RST, threat perception and defensive behaviour in participants with high versus low levels of social performance anxiety and hazardous drinking. Results indicated that there was a significant difference between the four groups on the combined independent
variables \((F(3, 214)=3.94, p=.000; \text{Wilks' Lambda}=54; \text{partial } \eta^2=.19)\). Means and standard deviations can be found in Table 5.14.

Table 5.14

*Means and Standard Deviations for R-RST, Threat Perception, and Defensive Behaviour in Social Performance Anxiety and Alcohol Groups*

<table>
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<tr>
<th>Variable</th>
<th>High SPS &amp; AUDIT ((N=27))</th>
<th>Low SPS &amp; AUDIT ((N=106))</th>
<th>High SPS &amp; low AUDIT ((N=21))</th>
<th>Low SPS &amp; high AUDIT ((N=64))</th>
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<td>(M)</td>
<td>(SD)</td>
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<td>48.11</td>
<td>6.39</td>
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<td>9.77</td>
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<td>3.34</td>
<td>21.80</td>
<td>2.87</td>
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</table>

Tests of between subject effects indicate that there were significant differences between the groups for FFFS \((F(3, 214)=6.24, p=.000, \text{partial } \eta^2=.08)\),
fear \((F(3, 214)=15.87, p=.000, \text{partial } \eta^2=.18)\) and anxiety \((F(3, 214)=34.08, p=.000, \text{partial } \eta^2=.32)\) when compared to controls. There were no significant differences the groups for r-BIS \((F(3, 214)=1.12, p=.340, \text{partial } \eta^2=.02)\), threat perception \((F(3, 214)=4.32, p=.006, \text{partial } \eta^2=.06)\), defensive direction \((F(3, 214)=1.01, p=.571, \text{partial } \eta^2=.01)\) or defensive intensity \((F(3, 214)=.77, p=.511, \text{partial } \eta^2=.01)\). Planned comparisons indicated that fear and anxiety were significantly higher in the high social performance/hazardous alcohol use group when compared to controls.

Results pertaining to elevated social interaction anxiety and hazardous drinking indicated that there was a significant difference between the four groups on levels of r-RST variables, threat perception and defensive behaviour \((F(3, 214)=4.28, p=.000; \text{Wilks’ Lambda}=.51; \text{partial } \eta^2=.20)\). Means and standard deviations can be found in Table 5.15.
## Table 5.15

Means and Standard Deviations for R-RST, Threat Perception, and Defensive Behaviour in Social Interaction Anxiety and Alcohol Groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>High SIAS &amp; AUDIT (N=23)</th>
<th>Low SIAS &amp; AUDIT (N=106)</th>
<th>High SIAS &amp; low AUDIT (N=21)</th>
<th>Low SIAS &amp; high AUDIT (N=68)</th>
</tr>
</thead>
<tbody>
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<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>FFFS</td>
<td>53.27</td>
<td>4.77</td>
<td>48.07</td>
<td>6.29</td>
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<td>r-BAS</td>
<td>20.30</td>
<td>5.19</td>
<td>22.09</td>
<td>3.32</td>
</tr>
<tr>
<td>FSS</td>
<td>123.80</td>
<td>38.32</td>
<td>63.06</td>
<td>40.10</td>
</tr>
<tr>
<td>STAI</td>
<td>53.57</td>
<td>11.06</td>
<td>37.99</td>
<td>8.59</td>
</tr>
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<td>7.50</td>
<td>62.61</td>
<td>8.74</td>
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<td>9.19</td>
<td>55.75</td>
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</tr>
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<td>36.84</td>
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<tr>
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<td>2.12</td>
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<td>2.00</td>
</tr>
<tr>
<td>Defensive intensity</td>
<td>22.13</td>
<td>3.72</td>
<td>21.87</td>
<td>2.95</td>
</tr>
</tbody>
</table>

Tests of between subject effects indicate that there were significant differences between the four groups for FFFS ($F(3, 213)=4.71$, $p=.003$, partial $\eta^2=0.06$), fear ($F(3, 214)=20.08$, $p=.000$, partial $\eta^2=0.22$), anxiety ($F(3, 213)=32.44$, $p=.000$, partial $\eta^2=0.31$), P-threat ($F(3, 213)=5.52$, $p=.001$, partial $\eta^2=0.07$), P-escape ($F(3, 213)=5.94$, $p=.001$, partial $\eta^2=0.08$) P-ambiguity ($F(3, 213)=3.87$,
SOCIAL ANXIETY AND ALCOHOL USE

$p=.010$, partial $\eta^2=.05$) and r-BAS $(F(3, 213)=8.73, p=.000$, partial $\eta^2=.11$). There was no significant differences across groups for r-BIS $(F(3, 213)=.67, p=.571$, partial $\eta^2=.01$), P-distance $(F(3, 213)=1.89, p=.13$, partial $\eta^2=.03$), P-concealment $(F(3, 213)=2.39, p=.070$, partial $\eta^2=.03$), defensive intensity $(F(3, 213)=.82, p=.486$, partial $\eta^2=.01$), or defensive direction $(F(3, 213)=1.06, p=.369$, partial $\eta^2=.02$). Planned comparisons indicated that FFFS, fear, anxiety, P-threat were significantly higher and P-escape and P-ambiguity were significantly lower in the high social interaction anxiety/hazardous alcohol use group when compared with controls. Controls had significantly higher levels of r-BAS when compared to participants with high levels of SA and alcohol use.

Due to the finding that r-BAS was higher in controls than participants with high SA and alcohol use, Post Hoc comparisons were more closely investigated to obtain a clearer understanding of the role of r-BAS in understanding social anxiety and alcohol use at different levels (high versus low). Significant differences which were not hypothesised were seen between the four groups. As reported in Table 5.13, groups with high levels of social anxiety and alcohol use had significantly higher levels of r-BAS than those with low levels of social anxiety and high levels of alcohol use. Those with low social anxiety and alcohol use had significantly lower levels of r-BAS than those with low levels of social anxiety and high levels of alcohol use. Finally, participants with high levels of social anxiety and low levels of alcohol use had significantly lower levels of r-BAS than those with low levels of social anxiety and high levels of alcohol use. In sum, results appear to indicate that those with elevated levels of alcohol use are more likely to report higher levels of r-BAS and those with high levels of social anxiety are likely to express lower levels of r-BAS.
Section Four: Threat Perception as Possible Mediators

Intercorrelations

Bivariate correlational analysis was conducted to investigate the relationships between r-BIS, FFFS, fear, trait anxiety, social anxiety, perceived level of threat, perceived level of escapability, and perceived distance from threat. Perceived ambiguity and availability for concealment variables were not utilised as they were not found to be correlated with FFFS, fear, or trait anxiety in prior analyses.

As expected, there was a moderate positive relationship between social anxiety and FFFS. Social anxiety was strongly correlated with Freeze, fear and anxiety. Additionally, social anxiety was positively correlated with perceived threat and negatively associated with perceived level of escapability from threat; however these relationships were weak in strength. In line with findings from study one of the current dissertation, r-BIS was not a correlate of social anxiety.

As expected, there were moderate positive relationships between the FFFS, fear and anxiety. FFFS was also weakly correlated with perceived level of threat and negatively correlated with escapability from threat. Specifically, Fight was not correlated with any threat perception variables, there was a weak positive correlation between Flight and perceived threat, and Freeze had a weak positive correlation with perceived threat and a moderate negative correlation with perceived level of escapability.

Trait anxiety and fear were both weakly positively correlated with perceived level of threat positively and negatively correlated with perceived escapability.
Table 5.16

*Bivariate Correlations between R-BIS, FFFS, Fear, Anxiety, Social Anxiety, and Threat Perception*

<table>
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<th>3.</th>
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<td>.23**</td>
<td>.21**</td>
<td>.18**</td>
<td>.27***</td>
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<td>10. P-escape</td>
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<td>-.05</td>
<td>-.23***</td>
<td>-.03</td>
<td>-.11</td>
<td>-.30***</td>
<td>-.24***</td>
<td>-.26**</td>
<td>-.56***</td>
</tr>
</tbody>
</table>

*Note. *p*.05, **p*.01, ***p*.001.*
FFFS, R-BIS, Fear and Anxiety as Predictors of Social Anxiety

Study one of the current thesis reported that FFFS, fear, and anxiety were significant predictors of social anxiety. R-BIS was not found to be related to social anxiety. Table 5.16 demonstrates that these relationships were replicated in the current sample. The following data analyses will extend upon this finding by investigating hypothesised mediators of these relationships which were found to be correlated in data from study two.

Meditational Analyses

A series of mediational assessments were conducted to determine whether threat perception mediated the relationship between trait variables (FFFS, fear, and anxiety) and social anxiety. Specifically, all variables tested for mediation were found to be significantly correlated with one another in prior analyses. Further, one would expect the relationship between FFFS, fear and anxiety and social anxiety to in part be explained by a bias in perceiving situations as highly threatening and confronting, as captured in the P-threat and P-escape variables. The first of such relationships tested were P-threat and P-escapability in potentially mediating the relationship between fear and anxiety.

P-threat and P-escapability as Mediators of the Relationship between Fear and Anxiety

The first series of regression analyses were used to assess the relationship between fear and social anxiety to determine if this relationship is mediated by P-threat. This was conducted following procedures outlined by Baron and Kenny (1986). According to this approach, four stages are performed using three separate regressions. Firstly, the direct effect of a predictor variable (independent
variable) onto an outcome variable (dependent variable) is first assessed. In a second analysis, another regression is performed to establish whether there is a relationship between the independent variable and the mediator. Next, regression analysis is conducted to determine whether the dependent variable is associated with the mediator. Finally, the dependent variable is regressed onto both the independent variable and the mediator to determine whether the inclusion of the mediator significantly reduces the strength of the direct relationship between the independent variable and the dependent variable.

The assumptions of multiple regression were tested before the completion of the tests. All observations were considered to be independent of one another, scatterplots and P-P plots indicated that the assumptions of normality, linearity, and homoscedacity were met, and tolerance values indicated none of the variables were redundant in the analysis and that there was no multicolinearity between the variables.

Table 5.17 presents the three steps required to test the hypothesis that P-threat will mediate the relationship between fear and social anxiety. In accordance with the guidelines outlined by Baron and Kenny (1986), this prediction was assessed with three separate analyses. In the first regression, social anxiety (the dependent variable) was regression onto fear (the independent variable). In the second, P-threat (the mediator) was regressed onto fear (the independent variable). Then, in the final equation social anxiety (the dependent variable) was regressed onto both fear (the independent variable) and P-threat (the mediator).

As can be seen in Table 5.17, fear was a significant predictor of social anxiety (see step one). Secondly, fear significantly predicted P-threat (see step
two). Finally when the impact of fear and P-threat on social anxiety was assessed
the effect size of fear on social anxiety was reduced by the introduction of P-
threat into the model (see step three). However the mediational effect of P-threat
was not significant ($z = .60, SE=.01, p = .550^{1}$).

Table 5.17

*Regression Analyses of Partial Mediation of Fear and Social Anxiety by P-threat*

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<td></td>
</tr>
<tr>
<td>Fear $\rightarrow$ P-threat</td>
<td>.06</td>
<td>.01</td>
<td>.27</td>
<td>4.18</td>
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<tr>
<td><strong>Step 3</strong></td>
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<td></td>
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<tr>
<td>Fear $\rightarrow$ Social anxiety</td>
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<td>.03</td>
<td>.58</td>
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<td>.000</td>
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<tr>
<td>P-threat $\rightarrow$ Social anxiety</td>
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<td>.15</td>
<td>.03</td>
<td>.56</td>
<td>.579</td>
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</table>

*Note.* $^{1}$ Sobel (1982) test.

Another series of regression analyses were used to assess the relationship
between fear and social anxiety to determine if this relationship is mediated by P-
escapability. In the first regression, social anxiety (the dependent variable) was
regression onto fear (the independent variable). In the second, P-escapability (the
mediator) was regressed onto fear (the independent variable). Then, in the final
equation social anxiety (the dependent variable) was regressed onto both fear (the
independent variable) and P-escapability (the mediator).

As can be seen in Table 5.18, fear was a significant predictor of social
anxiety (see step one). Secondly, fear significantly predicted P-escapability (see
step two). Finally when the impact of fear and P-escapability on social anxiety
was assessed the effect size of fear on social anxiety was reduced by the introduction of P-escape into the model (see step three), suggesting partial mediation. The Sobel test indicated that P-escapability did not significantly mediate the relationship between fear and social anxiety ($z = 1.77, SE = .01, p = .076^1$).

Table 5.18

Regression Analyses of Partial Mediation of Fear and Social Anxiety by P-escape

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</table>

Note: $^1$ Sobel (1982) test.

P-threat and P-escapability as Possible Mediators between Anxiety and Social Anxiety

In order to examine whether P-threat mediates the relationship between anxiety and social anxiety a series of regression analyses were utilised. Table 5.19 presents the three steps required to test this hypothesis. In the first regression, social anxiety (the dependent variable) was regression onto anxiety (the independent variable). In the second regression, P-threat (the mediator) was
regressed onto anxiety (the independent variable). Then, in the final equation social anxiety (the dependent variable) was regressed onto both anxiety (the independent variable) and P-threat (the mediator).

As can be seen in Table 5.19, anxiety was a significant predictor of social anxiety (see step one) and anxiety significantly predicted P-threat (see step two). When the impact of anxiety and P-threat on social anxiety was assessed the effect size of anxiety on social anxiety was reduced by the introduction of P-threat into the model (see step three). The Sobel test indicated that P-threat did not significantly mediate the relationship between anxiety and social anxiety (step 3; $z = 1.26, SE=.02, p = .207^1$).

Table 5.19

Regression Analyses of Partial Mediation of Anxiety and Social Anxiety by P-threat

<table>
<thead>
<tr>
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<th>SE</th>
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<th>t</th>
<th>p</th>
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<td>Step 1</td>
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<tr>
<td>Anxiety → Social anxiety</td>
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<td>P-threat → Social anxiety</td>
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<td>.07</td>
<td>1.43</td>
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Note. $^1$ Sobel (1982) test.

Another series of regression analyses were performed to examine whether P-escapability mediated the relationship between trait anxiety and social anxiety. In the first regression, social anxiety (the dependent variable) was regression onto
anxiety (the independent variable). In the second regression, P-escape (the mediator) was regressed onto anxiety (the independent variable). Then, in the final equation social anxiety (the dependent variable) was regressed onto both anxiety (the independent variable) and P-escapability (the mediator).

As noted in prior analyses, anxiety was a significant predictor of social anxiety (see step one in Table 5.19). Secondly, anxiety significantly predicted P-escape (see step two in Table 5.20). Finally when the impact of anxiety and P-escape on social anxiety was assessed the effect size of anxiety on social anxiety was reduced by the introduction of P-escape into the model (see step three in Table 5.20). However, the mediational effect of P-escape on the relationship between anxiety and social anxiety was not significant ($z = 1.54, SE = .03, p = .124^1$).

Table 5.20

*Regression Analyses of Partial Mediation of Anxiety and Social Anxiety by P-escape*

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<td>-.24</td>
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*Note.* $^1$ Sobel (1982) test.
P-threat and P-escapability as Possible Mediators for the Relationship between FFFS and Social Anxiety

In order to test to determine whether P-threat mediates the relationship between FFFS and social anxiety, another series of regressions were performed. In the first regression, social anxiety (the dependent variable) was regression onto FFFS (the independent variable). In the second regression, P-threat (the mediator) was regressed onto FFFS (the independent variable). Then, in the final equation social anxiety (the dependent variable) was regressed onto both FFFS (the independent variable) and P-threat (the mediator).

As can be seen in Table 5.21, FFFS was a significant predictor of social anxiety (see step one). Secondly, FFFS significantly predicted P-threat (see step two). Finally when the impact of FFFS and P-threat on social anxiety was assessed the effect size of fear on social anxiety was reduced by the introduction of P-threat into the model (see step three). Results indicated that the meditational effect of P-threat on the relationship between FFFS and social anxiety was not significant ($z = 1.65$, $SE = .07$, $p = .099$).
Table 5.21

**Regression Analyses of Partial Mediation of FFFS and Social Anxiety by P-threat**

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<td>.12</td>
<td>1.86</td>
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\(^1\) Sobel (1982) test.

In order to test whether P-escape was a mediator of the relationship between FFFS and social anxiety, social anxiety (the dependent variable) was regressed onto FFFS (the independent variable), P-escape (the mediator) was regressed onto FFFS (the independent variable). Then, in the final equation social anxiety (the dependent variable) was regressed onto both FFFS (the independent variable) and P-escape (the mediator).

As can be seen in Table 5.22, FFFS was a significant predictor of social anxiety (see path c in Figure 5.2). Secondly, FFFS significantly predicted P-escape (see path a in Figure 5.2). Finally, when the impact of FFFS and P-escape on social anxiety was assessed the effect size of fear on social anxiety was reduced by the introduction of P-escape into the model (see path c for direct effect and c' for mediation effect in Figure 5.2). Results indicated that P-escape was a significant partial mediator of the relationship between FFFS and social anxiety (\(z = 2.25, SE=.07 p=.024^1\)).
Table 5.22

*Regression Analyses of Partial Mediation of FFFS and Social Anxiety by P-escape*

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<td>4.68</td>
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<td>FFFS → P-escape</td>
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<td>.04</td>
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\[
\beta = -.23 \text{ (path a)} \quad \beta = -.19 \text{ (path b)} \quad \beta = .30 \text{ (path c)} \quad \beta = -.26 \text{ (path c')} \]

Figure 5.2. The role of P-escape in mediating the relationship between FFFS and social anxiety. Tested on the basis of Frazier, Tix & Baron (2004). The direct effect (c) was significantly reduced by the inclusion of P-escape (c') in the model.
Discussion

Overview

The primary aim of study two was to extend upon findings derived in study one by employing a threat scenario technique to obtain an understanding of the extent to which social anxiety and alcohol use relates to defensive behaviours and threat perception. This study was the first known to the author to investigate the revised r-RST in relation to defensive behaviour and threat perception in understanding social anxiety and alcohol use. The following section will first discuss findings relating to the relationship between RST, defensive behaviour and threat perception before discussing those pertaining to these variables in understanding social anxiety and alcohol use. A visual overview of findings can be found in table 5.25.

The study found that levels of FFFS were associated with defensive direction, intensity and threat perception. Specifically, results indicate that Fight and Freeze were correlated with defensive direction in a manner which indicates a preference for orientation away from threat. Not surprisingly, Fight was associated with orientation towards threat. Flight was the only one of the FFFS variables to be associated with defensive intensity suggesting that Flight was associated with a more intensive response to threat.

Results also demonstrated that the FFFS, specifically Flight and Freeze, were correlated with heightened perceived intensity of threat in the threat scenarios. Moreover, Freeze was significantly associated with the perception of threat as less escapable. Interestingly, FFFS was not found to be associated with perceived distance from threat, or perceived level of concealment. FFFS was also
not associated with the perceived level of ambiguity in the threat scenarios which is not surprising as r-BIS is considered to be the system responsible for conducting a risk assessment when ambiguity is present (Corr, 2008b).

Incongruent with hypotheses, R-BIS was not associated with anxiety, perceived level of threat, or defensive distance. However, it was related to perceived level of ambiguity in a weak yet significant correlation. Finally, results supported the prediction that r-BAS would be negatively correlated with defensive direction, indicating a greater tendency to orientate towards threat with increasing levels of r-BAS sensitivity. Interestingly, α-BAS was not found to be associated with defensive direction.

Results pertaining to fear and threat perception were partially congruent with hypotheses. As hypothesised fear was associated with an orientation away from threat (defensive direction), and was positively associated with perceived level of threat (high scores indicating higher levels of perceived threat). Fear was also associated with a lower level of perceived escapability from threat. Incongruent with the hypothesis, fear was not associated with the perceived level of concealment from threat nor was it correlated with defensive intensity. It was also hypothesised that trait anxiety would be negatively correlated with defensive direction (orientation towards threat) and perceived level of escapability and positively correlated with perceived level of threat. Results were partially supported as anxiety was related to perceived level of threat and negatively correlated with escapability; however, anxiety was not found to be associated with defensive direction. Data did support the hypothesis that fear would be associated with orientation away from threatening situations.
When group analyses were conducted investigating high and low levels of social anxiety, significant differences in threat perception were found. Specifically, participants with elevated levels of social interaction anxiety were found to perceive threat is less escapable, more threatening, and closer in distance than controls. There were no significant differences between high and low levels of social anxiety in threat perception for social performance anxiety. Results indicated that there was no relationship between defensive direction and social anxiety.

There were also differences noted when participants with elevated social interaction anxiety, social performance and co-morbid hazardous alcohol use were compared to controls. In particular, when compared to controls individuals with heightened social interaction anxiety and hazardous alcohol use reported higher levels of FFFS, fear, trait anxiety, perceived level of threat, and lower levels of escapability and ambiguity. Results were different when social performance anxiety and co-morbid hazardous drinking was compared to controls. Individuals with elevated social performance anxiety and co-morbid hazardous drinking reported heightened FFFS, fear, anxiety; however, there were no differences in any of the threat perception variables. There were also no significant differences noted in r-BAS or defensive direction when the high social anxiety and hazardous drinking group was compared to controls. However, inspection of post hoc comparisons indicated that r-BAS was significantly higher in the hazardous drinking group when social anxiety was low when compared to groups where social anxiety was higher.

Finally, data supported the contention that threat perception mediated the relationship between r-RST variables and social anxiety. Results indicated that
perceived level of threat and escapability partially mediated the relationship between fear and social anxiety and anxiety and social anxiety. The relationship between FFFS and social anxiety was partially mediated by the participant's perceived level of threat. Of particular interest was the relationship between FFFS and social anxiety as data indicated that this relationship was mediated by the participant's perceived level of escapability from threat.

In the following sections, results of the present study will be discussed in detail. Firstly, results pertaining to r-RST, threat perception and defensive direction and intensity will be discussed, followed by the relationships between fear and anxiety in understanding the perception and response to threat. The association between high and low levels of social anxiety and alcohol use in relation to threat perception and defensive behaviour will be discussed. Following this, the discussion will focus on the role of threat perception in mediating the relationships between r-RST, fear, anxiety and social anxiety. Finally, an integration of the results will be provided in addition to conclusions and limitations of the current research.
Table 5.23

*Summary of Findings Relating to Threat Perception and Defensive Behaviour from Study Two*

<table>
<thead>
<tr>
<th></th>
<th>P-threat</th>
<th>P-escape</th>
<th>P-distance</th>
<th>P-ambiguity</th>
<th>P-concealment</th>
<th>Defensive direction</th>
<th>Defensive intensity</th>
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<tbody>
<tr>
<td></td>
<td>(low=less intense)</td>
<td>(low=less escapable)</td>
<td>(low=proximal)</td>
<td>(low=ambiguous)</td>
<td>(low=less able to hide)</td>
<td>(low=towards threat)</td>
<td>(low=less intense)</td>
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<td>1. r-RST</td>
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<td>Fight</td>
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<td>.</td>
<td>Towards threat</td>
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<tr>
<td>Flight</td>
<td>+</td>
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<td>.</td>
<td>Away from threat</td>
<td>+</td>
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<tr>
<td>Freeze</td>
<td>+</td>
<td>-</td>
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<td>.</td>
<td>Away from threat</td>
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<td>r-BIS</td>
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<tr>
<td>r-BAS</td>
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<td>Towards threat</td>
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<td>2. Fear and Anxiety</td>
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<tr>
<td>Fear</td>
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<td>.</td>
<td>Away from threat</td>
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Table 5.25

Summary of Findings from Study Two (cont)

<table>
<thead>
<tr>
<th></th>
<th>P-threat</th>
<th>P-escape</th>
<th>P-distance</th>
<th>P-ambiguity</th>
<th>P-concealment</th>
<th>Defensive direction</th>
<th>Defensive intensity</th>
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<tr>
<td>Anxiety</td>
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<td>3. High social anxiety versus controls</td>
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<tr>
<td>High SIAS</td>
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<td>High SPS</td>
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<td>4. High social anxiety/alcohol use versus controls</td>
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<td>High SA &amp; alc</td>
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<td>High SIAS &amp; alc</td>
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<td>High SPS &amp; alc</td>
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<td>5. Mediation</td>
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<td>between FFFS and SA</td>
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<td>significantly mediated.</td>
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*Note. +/- = significant positive/negative correlation or direction of significant differences in the group indicated.*
RST, Threat Perception and Defensive Behaviour

This study was an extension of study one and aimed to examine the specific processes that might be facilitating the relationship between r-RST variables and social anxiety. In order to do this, the relationships between systems of r-RST, threat perception and defensive behaviour were first investigated. Results offered support for the content that r-RST systems, in particular the FFFS and r-BAS, is associated with threat perception, defensive direction and defensive intensity. Specifically, results indicated that heightened Flight and Freeze sensitivities were correlated with the tendency to orientate away from threat (defensive direction), Fight was associated with the tendency to orientate towards threat, and heightened Flight, but not Fight and Freeze, was related to an intense reaction to threat (defensive intensity). Participants with heightened FFFS sensitivity, particularly Flight and Freeze, perceived the scenarios as more threatening, and those with elevated levels of Freeze indicated that they perceived the scenarios to be less escapable than others. Interestingly, FFFS was not found to be associated with perceived distance from threat, perceived level of concealment, or perceived level of ambiguity in the threat scenarios. Whilst r-BIS was not associated with trait anxiety or defensive distance as was predicted, it was found to be correlated the perceived level of ambiguity in the threat scenarios. Finally, results supported the prediction that r-BAS would be associated with defensive direction, indicating a greater tendency to orientate towards threat with increasing levels of r-BAS sensitivity. Interestingly, o-BAS was not found to be associated with defensive direction offering further support that r-BAS and o-BAS measure different aspects of BAS output.
The relationships between r-RST constructs, threat perception and defensive reactions were largely in line with what would be expected according to revisions to RST (Gray & McNaughton, 2000). In these revisions, Gray and McNaughton (2000) asserted that RST subsystem activation was dependent upon defensive direction which distinguishes between threats which elicit fear and avoidance (FFFS activation) and those which are less clear and require a risk assessment and anxious approach, leading to anxiety (r-BIS activation). Results were largely consistent with this contention, as FFFS was found to be related to fear and orientation away from threat; however, r-BIS was not related to defensive behaviour but was associated with perceived ambivalence. There was also a weak significant relationship between r-BAS and appetitive behaviour in response to threat.

Results also extended upon this theoretical understanding of FFFS by obtaining an understanding of the subsystems of FFFS in response to threats. Data indicated that both Flight and Freeze were associated with movement away from threat. This indicates that those who have an underlying tendency to Freeze in the face of threat report a preference towards defensive behaviours which orientate away from the threatening stimuli (i.e., run, hide) rather than those which confront the threat or stimulate orientation towards it (e.g., attack, look for a weapon, threaten to scream). Congruent with rodent research (Blanchard & Blanchard, 1989; Pinel & Mana, 1989), Freeze was heightened in those who perceive threats as intense and inescapable whereas Flight was elevated in individuals who perceived the scenarios to be highly threatening and when escape was possible. FFFS was not associated with the perceived level of concealment from threat, ambiguity, or distance from threat. Results suggest that people with
heightened FFFS sensitivity assess the level of the threat, the possibility for escape, and then either freeze or flee without consideration of other situational elements (e.g., ambiguity, concealment etc.).

Based on findings from animal research, one may have expected orientation toward threat in participants with elevated r-BIS, particularly as unclear threats or ambiguity has been demonstrated to be implicated in initiating approach investigative behaviour in rodents (Blanchard, et al., 1989; Pinel & Mana, 1989). However, results were not consistent with this prediction. One possible explanation for this finding is related to the methodology utilised, in particular the use of the 12 threat scenarios (Blanchard, Hynd, et al., 2001). Although these scenarios were designed to assess differing levels of threat (Blanchard, Griebel, et al., 2001), it is possible that they were perceived to be too threatening by this sample to elicit a goal conflict/risk assessment response which would implicate r-BIS. Similarly, Perkins et al. (2010) suggested the vignettes may have been too threatening to elicit differences in defensive intensity in those with varying levels of o-BIS. Another explanation for this finding is the vignettes did not capture enough ambiguity or goal conflict required to elicit a risk assessment in this population. Thus, the threats appear to have engendered a preconscious automatic level of processing, activating the FFFS/fear response, rather than the higher level cognitive processing thought to be implicated in the cautious appetitive behaviour which is precipitated by r-BIS activation (Corr, 2011). Further investigation of the perception of these vignettes and neurological activation is required to explore these results further.

Whist r-BIS was not associated with defensive direction, a small positive correlation between o-BIS and defensive direction indicated movement away
from threat. This result is consistent with human studies which have investigated o-RST and threat perception (Perkins, et al., 2010; Perkins & Corr, 2006). The difference in findings between the revised and original conceptualisation of RST highlights the distinct changes made to this motivational system by Gray and McNaughton (2000). Whilst r-BIS is the subsystem hypothesised to be responsible for mediating goal conflict, o-BIS was conceptualised as a system which was sensitive to general punishments such as anxiety, as well as intensive and inherent fear stimuli. In terms of defensive behaviour, it was the o-BIS which was considered to be responsible for eliciting aversive motivation away from conditioned stimuli (Corr, 2011; Gray & McNaughton, 2000). Given this, the finding that o-BIS, but not r-BIS, was associated with aversive movement is congruent with the literature. Results may also suggest that the extent to which an individual evaluates goal conflict is not important in understanding orientation towards or away from threat. However, it is also possible that the relatively new r-RST measure used was not successfully capturing the goal conflict evaluation enough to find a relationship between o-BIS and defensive direction.

There were also distinctions noted between r-BAS and o-BAS in understanding defensive behaviour and threat perception. There was no relationship observed between o-BAS and threat variables including defensive direction. However, r-BAS was found to be correlated with appetitive movement towards threat. R-BAS was also positively associated with Fight, and negatively correlated with Freeze which as previously discussed was related to orientation away from threat. The purpose of the r-BAS is to reduce the temporo-spatial distance between the current state and a potential reward (Gray & McNaughton, 2000). Given this information, it seems r-BAS may motivate an appetitive fight
response in the face of threat. Thus, the reward element associated with motivating the appetitive behaviour may be the positive feelings associated with addressing and potentially reducing the threat (non-punishment). Interestingly, r-BAS was not associated with the threat perception variables measured in this study which suggests that this appetitive behaviour is not contingent upon the perception of threatening situational factors. Data also suggests that r-BAS was not associated with highly intensive reactions to threat such as attacking, yelling, or looking for a weapon indicating that in response to threat fight behaviours may entail responses such as threatening to scream or threatening to attack a menacing individual.

In summary, results were the first to demonstrate a relationship between r-RST constructs, defensive behaviour and threat perception. Findings were largely consistent with hypotheses derived from the theoretical understanding of r-RST (Gray & McNaughton, 2000), animal literature (e.g., Blanchard, Hynd, et al., 2001; Blanchard & Blanchard, 1989; Blanchard & Blanchard, 1990; Blanchard, et al., 1997), and the small number of studies performed to investigate threat perception and defensive behaviour in humans (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010; Perkins & Corr, 2006). Results offer support to the contention that individuals with heightened FFFS sensitivity tend to magnify threat, are inclined to Freeze if the situation is perceived to be inescapable or flee if escape is a viable option. Consistent with past research, o-BIS was associated with orientation away from threat; however r-BIS was not related to orientation towards threat as was hypothesised. Interestingly, r-BAS was related to orientation towards threat and low intensity fight responses. Such results are pertinent to the current research as r-RST variables predicted social anxiety and
hazardous alcohol use in study one of the current dissertation. By extension, threat perception was investigated as method through which the relationship between r-RST and social anxiety may be mediated in the current study. The following section will now review the relationship between fear, anxiety, threat perception and defensive behaviour.

Fear, Anxiety, Threat Perception and Defensive Behaviour

Results offered partial support for hypotheses pertaining to the relationships between fear and anxiety, threat perception and defensive behaviour. Hypotheses were derived from research of a similar nature (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010; Perkins & Corr, 2006) and from studies investigating threat responsiveness in animals (e.g., Blanchard, Griebel, et al., 2001; Blanchard & Blanchard, 1989; Blanchard, et al., 1989). The current study extends this line of work by focusing on the role of these processes in understanding social anxiety and hazardous alcohol use. Based on findings from this research, and conceptualisations of fear and anxiety as per Gray and McNaughton (2000), fear was expected to be positively associated with defensive direction (orientation away from threat), perceived intensity and proximity, and negatively associated with escapability and concealment. Furthermore, anxiety was predicted to be negatively associated with orientation towards threat and perceived escapability and positively associated with perceived level of threat. Data from this study indicated that fear was associated with an orientation away from threat (defensive direction), and was positively associated with perceived level of threat (high scores indicating higher levels of perceived threat) as was hypothesised. Fear was also associated with a lower level of perceived escapability from threat. Incongruent with the hypothesis, fear was not associated
with the perceived level of concealment from threat nor was it correlated with defensive intensity. It was also predicted that trait anxiety would be negatively correlated with defensive direction (orientation towards threat) and perceived level of escapability and positively correlated with perceived level of threat. Hypotheses were partially supported; however, anxiety was not found to be associated with defensive direction. Data did support the contention that fear, but not anxiety, would be associated with orientation away from threatening situations.

As reported and consistent with predictions fear was associated with orientation away from threat. However, incongruent with hypotheses, anxiety was unrelated to defensive direction towards threat. Results offer support for Gray and McNaughton’s (2000) contention that fear is associated with movement away from threat. However, anxiety was not associated with orientation towards threat. This finding is not consistent with animal research which has reported defensive approach behaviour in lower mammals (Blanchard, Griebel, et al., 2001; Blanchard, et al., 1997).

Results offer partial support for the role of defensive behaviour as observed in rodent defensive behaviour (Blanchard, Griebel, et al., 2001; Blanchard & Blanchard, 1989; Blanchard, et al., 1997). The distinction between fear and anxiety were based upon findings which noted that rodent defensive behaviour differed according to the administration of panicolytic, panicogenic or anxiolytic drugs (Blanchard, et al., 1997). That is, panicolytic drugs and panicogenic drugs were found to inhibit and enhance flight behaviour; a finding which was not replicated with the administration of anxiolytics. Further, anxiolytic medication was found to reduce appetitive risk assessment behaviour
(Blanchard, et al., 1997). Preliminary research applying defensive direction to human threat responsiveness has shown a curious discrepancy between rodent and human behaviour. Whilst orientation away from threat has been repeatedly demonstrated in humans in response to threat (Perkins, et al., 2010; Perkins & Corr, 2006), findings pertaining to anxious approach are less clear. Perkins and Corr (2006) indicated that trait anxiety was associated with orientation toward threat, whereas Perkins et al. (2010) found no such association in their sample. However, Perkins and Corr (2006) found trait anxiety to predict orientation toward threat in multiple regression but not correlational analyses; a finding attributed by the authors to the inclusion of other predictors of defensive direction (e.g., o-BIS, fear) which may have served to reduce error variance making the analyses more sensitive to small differences in defensive direction. Thus, the current data are largely consistent with past research in human populations.

Moreover, the finding that anxiety was not related to defensive direction is consistent with the previously mentioned non significant relationship between r-BIS and defensive direction. R-BIS is thought to be the mechanism underpinning a risk assessment/investigation of threat which involves appetitive behaviour and sub-sequential anxiety in instances that promote a goal conflict. Taken together these findings suggest that goal conflict, and the subsequent anxious risk assessment behaviour is not pertinent in understanding orientation towards or away from threat in this population.

Fear, anxiety, and the perception of threat were also investigated. As hypothesised, fear and anxiety were positively associated with the perception of threat intensity and negatively with the level of escapability from threat. Results offer partial support for Perkins et al.'s (2010) finding that fear, as measured by
the FSS (Wolpe & Lang, 1977), was positively correlated with perceived intensity and concealment from threat, and negatively correlated with escapability and perceived distance from threat (more distal). They also found anxiety to be negatively associated with escapability but not threat intensity as was found in the present data. Findings from the present study suggest that individuals with high trait fearfulness and trait anxiety tend to magnify the intensity of threats and perceive them as confronting and inescapable.

Despite the similarities in threat perception between trait anxiety and fearfulness, there appears to be behavioural differences in the way individuals with these tendencies respond to threat by orientating themselves in their environment. For example, despite both variables being associated with the perception of threats as intense and inescapable fearfulness was related to orientation away from threatening stimuli whereas anxiety was not. One explanation for this is that defensive direction is not solely influenced by the perception of threat and the emotional response to threatening stimuli (i.e., fear and anxiety), but also directly influenced by systems thought to regulate these responses, the FFFS and the r-BIS (Corr, 2011; McNaughton & Corr, 2008). Whilst the r-BIS was found to be unrelated to defensive direction, the FFFS was found to initiate orientation away from threatening stimuli.

Results indicate that perceived proximity to threat is not a consideration reported to be associated with trait anxiety or fearfulness. This is an interesting finding, particularly as fear is said to be engaged when threat is perceived to be proximal whereas anxiety is elicited when threat is distal or when threat is anticipated (McNaughton & Corr, 2004). Fear is also thought to take precedence over anxiety when threat is perceived to be proximal. Only one prior study
(Perkins, et al., 2010) has investigated the relationship between perceived distance from threat, trait anxiety and fearfulness. Using the same methodology of the present research, Perkins et al., (2010) found fear to be associated with proximal threats. However, this finding was not observed in the current study. The present study did, however, find a relationship between social interaction anxiety and proximity from threat. This will be discussed in detail in the following section.

In addition, fear was not associated with perceived level of concealment as was anticipated. Animal data has demonstrated that rodents seek out a place to hide when threats are intense and escape is implausible, thus avoiding the threat but not addressing it (Blanchard & Blanchard, 1988). This behavioural response to threat was recently replicated in another study with a human population (Perkins, et al., 2010). Results from the current study demonstrated a positive relationship between fear and perceived level of threat intensity and a negative relationship between fear and perceived level of escapability, indicating the perception of having no way of escape. Results linking r-RST variables to threat perception may assist to explain why concealment was not an option utilised in response to threat. Specifically, the FFFS was found to be associated with fear, as prescribed by r-RST (Gray & McNaughton, 2000). However, the different FFFS components were found to be differentially associated with threat perception. Specifically, the tendency to Freeze in response to exposure to threat was positively associated threat intensity and negatively correlated to perceived escapability. Thus, higher levels of 'Freeze' might predispose individuals to perceive environmental threats as highly intense and unavoidable. Whereas, people who tend to defensively flee magnify threats yet perceive escape as a viable option. Data suggested that fear was found to be related to threat
magnification and the perception of threat as inescapable. Thus, as the FFFS and fear are associated, by extension, high threat intensity and the perception of inescapability may be associated with the tendency to Freeze in response to threat, rather than hiding or concealing oneself. These results suggest that threat perception may be important in understanding social anxiety, particularly as Freeze was the most important r-RST variable found to be related to social anxiety in study one of the current thesis.

In sum, results suggest that individuals with elevated scores on fear and anxiety traits tend to perceive threats in a similar manner; that is, they magnify threats and perceive them to be unavoidable. However, they differ in terms of the subsequent behavioural response; that is, those with heightened trait fearfulness appear to orientate away from threatening stimuli whereas those with trait anxiety do not. Data appears to indicate that fearfulness and anxiety is not associated with concealment/hiding from threat nor is it associated with distance from threatening stimuli.

R-RST, Threat Perception and Defensive Behaviour in Understanding Social Anxiety and Co-morbid Alcohol Use

R-RST, threat perception, and defensive behaviour were investigated in understanding social anxiety and co-morbid alcohol use. The following sections will review findings with regard to the associated hypotheses. The first section will review the findings and hypotheses pertaining to social anxiety only. Following this, results relating to social anxiety and co-morbid alcohol use will be discussed.
Social Anxiety, Threat Perception and Defensive Behaviour

As mentioned, group analyses were conducted to investigate threat perception and defensive behaviour for participants with differing levels of social anxiety. Results identified differences in the way threats are perceived in participants with differing levels of social interaction anxiety when compared to social performance anxiety. Data clearly implicated threat perception in understanding elevated levels of social interaction anxiety when compared to controls; however, incongruent with proposed hypotheses threat perception did not differ for those with high versus low levels of social performance anxiety. Specifically, individuals with social interaction anxiety, but not social performance anxiety, perceived threats as more intense, less escapable, and more proximal than controls. Results also suggest that social anxiety was not related to orientation away from threat as was predicted, with no relationship found between social anxiety and defensive direction.

Results served to obtain a clearer understanding of the way individuals with different types of social anxiety perceive threat. Results appear to indicate that those with generalised social interaction anxiety perceive threat differently from those with more particular social fears. This is not surprising given social interaction anxiety and social performance anxiety can be quite distinct constructs, even though they frequently co-exist (Mattick & Clarke, 1998). As previously mentioned, diagnostic criteria for SAD contains a generalised specifier which refers to individuals who express fear in most social environments; not solely situations involving performance such as is found in the non-generalised/specific subtype (APA, 2000). The social interaction anxiety scale (SIAS) was designed to assess the extent to which someone experiences
generalised social anxiety or at the higher end of the continuum G-SAD, whereas the social phobia scale (SPS) assesses fears of being scrutinised whilst performing tasks (e.g., speaking, eating, writing), such as that typically seen in specific social anxiety or S-SAD (Mattick & Clarke, 1998). Thus, the finding that those with elevated social interaction anxiety tend to magnify threats is consistent with the understanding of the clinical diagnoses the social interaction anxiety scale and social phobia scale relate to (Mattick & Clarke, 1998). G-SAD is considered to be a more severe and debilitating form of social anxiety than S-SAD, and closer to the upper end of the social anxiety continuum ( Rapee & Spence, 2004 ). Those with G-SAD or heightened social interaction anxiety have fears of multiple social situations whereas those with S-SAD or social performance anxiety tend to have fears of a small number of situations (Mattick & Clarke, 1998). Given the more generalised type of social anxiety, social interaction anxiety, is considered to be more severe and widespread than the more specific social performance anxiety, it is not surprising that it is the former who perceive threats as highly intense.

Results suggest that individuals with generalised social interaction anxiety tend to magnify the intensity of general threat stimuli suggesting that the fear does not solely occur in response to social stimuli. This finding is congruent with results which indicated that levels of FFFS are significantly correlated with social interaction anxiety as the FFFS is thought to mediate responses to punishment stimuli and hypersensitivity in this system is thought to magnify the perception of threat in the environment (Gray & McNaughton, 2000). This is an interesting finding which gives a clearer understanding of threat perception and hypervigilance in individuals with social interaction anxiety which is not necessarily at a clinical level. It is particularly interesting in the context of
tailoring treatment to this group of individuals. Results suggest that these individuals may not only benefit from cognitive restructuring regarding perceptions of social stimuli (Heimberg et al., 1990; Heimberg, Salzman, Holt, & Blendell, 1993; Rapee & Heimberg, 1997), as indicated by elevated self-report social interaction anxiety, but they may also benefit from such treatment designed to target threat perception in general.

This finding also offers support to a number of studies in non-RST literature which have linked social threat perception to social anxiety using various behavioural methodologies (e.g., Asmundson & Stein, 1994; Hope, Rapee, Heimberg, & Dombeck, 1990; Horley, Williams, Gonsalvez, & Gordon, 2004). For example, research has demonstrated that individuals with SAD demonstrate longer latencies when processing words which may be associated with the type of threatening negative self schemas evident in individuals with SAD (e.g., criticized, inadequate) (Hope et al., 1990). Further, when compared to controls participants with SAD have been shown to respond more quickly to dot probes when they preceded social threat cues rather than neutral or physical threat stimuli, indicating a bias evaluation of social or evaluative stimuli (Asmundson & Stein, 1994). They have also been shown to have difficulty disengaging from social threat stimuli as indicated by significantly longer latency periods than controls post administration of a discrepant cued stimuli (Amir, Elias, Klumpp, & Przeworski, 2003). Finally, research has also demonstrated that individuals with SAD automatically orientate their attention towards threatening social stimuli (angry faces) without awareness (Mogg & Bradley, 2002) before avoiding them by turning away to reduce subsequent anxiety and negative affect (Mansell, Clark, Ehlers, & Chen, 1999).
Whilst the aforementioned studies investigated threat perception in those with social anxiety, they did not explore differences between social anxiety subtypes. Indeed, results regarding social anxiety and threat perception indicated there were differences in threat perception between those with social interaction and social performance anxieties. Specifically, individuals with social interaction anxiety, but not social performance anxiety, reported a perception of threats as closer and inescapable. The difference in threat perception between social interaction and social performance anxiety appear to reflect the extent to which individuals with social interaction anxiety and social performance anxiety are required to encounter potentially threatening stimuli. Specifically, social interaction is an integral factor in daily functioning for most people (Booth & Hasking, 2009) whereas being evaluated or scrutinised while performing certain tasks may be more readily avoided (Merikangas, et al., 2002). Thus, findings are consistent with the nature of the different subtypes of social anxiety, as those who must face anxiety provoking social stimuli perceive threat as closer and less escapable; whereas those who may be able to avoid being scrutinised or evaluated do not.

In sum, results from the present research offered novel findings with regard to social interaction anxiety and social performance anxiety and the distinct methods through which individuals with these anxieties perceive threat. Findings are congruent with the measurement of social interaction and performance anxiety and the specific subtypes of anxiety they were designed to assess. Specifically, participants who reported heightened social interaction fears (the extremity of this has been demonstrated to be present in those with G-SAD) also indicated that they perceive threats to be higher in intensity, closer and
inescapable. The following section will discuss the role of defensive behaviour and threat perception in understanding the co-morbidity between social anxiety and alcohol use.

**Threat Perception and Defensive Behaviour in Understanding Social Anxiety and Alcohol Use**

Threat perception and defensive behaviour were also investigated in those with differing levels of social anxiety and alcohol use. When participants with elevated social anxiety and hazardous alcohol use were compared with controls, hypotheses were largely supported. Specifically, when compared to controls data suggested that individuals with elevated levels of social anxiety and alcohol use reported significantly higher levels of FFFS, fear, trait anxiety, perceived threat intensity, and the perception of threat as less escapable. Whilst those with high levels of social anxiety and alcohol use perceived threats as less ambiguous than controls, this difference failed to reach statistical significance ($p=.053$). There were no differences between groups for r-BIS, perceived distance from threat, perceived level of concealment from threat, or defensive behaviour. Incongruent with the hypotheses, r-BAS was found to be significantly higher in controls when compared to the high social anxiety and hazardous alcohol use group. However, inspection of post hoc comparisons indicated that r-BAS was significantly higher in the low social anxiety/high alcohol use group when compared with the high social anxiety/high alcohol use group.

Analyses investigating r-RST, threat perception, and defensive behaviour for participants with social interaction and social performance anxiety and co-morbid hazardous alcohol use demonstrated differing relationships. Specifically, when compared to controls participants with heightened social interaction anxiety
reported higher levels of FFFS, fear, trait anxiety, and perceived threat intensity. Individuals with high levels of social interaction anxiety also perceived threat to be less ambiguous (indicating a clear threat) and less escapable. Results also suggest that individuals with low levels of social anxiety and high levels of alcohol use are likely to initiate appetitive behaviour, as indicated by higher r-BAS; however this was not reflected in defensive direction scores. There were also trends suggesting that individuals with high co-morbidity perceived threat as less able to be hidden from than controls; however, this finding did not reach statistical significance. Results did not indicate that those with heightened social anxiety and hazardous alcohol use to react more intensely to threats than controls as there was no difference in defensive intensity.

Results differed when social performance anxiety and hazardous alcohol use was compared to controls. In line with results for social interaction anxiety, those with elevated levels of social performance anxiety and hazardous alcohol use reported higher levels of FFFS, fear, and trait anxiety. R-BAS was also higher in the low social anxiety and nonhazardous alcohol use group. However, there were also no differences in perceived concealment from threat or defensive behaviours. Other results relating to threat perception for individuals with elevated social performance anxiety differed from results pertaining to social interaction anxiety. Specifically, there were no differences between groups in perceived threat intensity, escapability from threat, nor were there differences in perceived ambiguity of the threats for those with elevated social performance anxiety and hazardous alcohol use.

Results pertaining to social anxiety (social interaction and social performance anxiety) and co-morbid hazardous alcohol use suggest that
individuals with these co-morbidities have higher levels of FFFS sensitivity, trait anxiety and fearfulness when compared with controls. There were also trends towards magnifying threats, perceiving them as more intensive than controls; although this difference was not significant ($p=.051$). These findings appear to be consistent with predictions based upon the proposed role of the FFFS as the mediator for aversive stimuli and responsible for the emotional response fear (Gray & McNaughton, 2000).

There were, however, distinct differences in the way individuals with social interaction anxiety and co-morbid hazardous drinkers perceived threat when compared to individuals with social performance anxiety and hazardous alcohol use. Firstly, data suggests that individuals with social interaction anxiety, but not social performance anxiety, found threat to be clear and unambiguous. This may offer some understanding of the way people with different types of social anxiety perceive their environment. As previously discussed, elevated scores on the social interaction anxiety scale used in the present study have been shown to be associated with G-SAD (Brown, et al., 1997). Moreover, G-SAD and social interaction anxieties are thought to be higher on the social anxiety spectrum than more specific social performance anxieties (Brown, et al., 1997; Turner, Beidel, & Townsley, 1992). Individuals with heightened social interaction anxiety perceive threats in multiple social situations (Turner, et al., 1992) and appear to be hypersensitive to perceiving threats in everyday situations due to heightened FFFS sensitivities. It seems this process may lead individuals with social interaction anxiety to feel that there are clear and unquestionable threats in their environment which is likely to activate a FFFS activated fear response. Furthermore, unambiguous, clear threats are unlikely to require a risk
assessment or the type of inquisitive approach that would require r-BIS activation. These results may offer some explanation for the lack of r-BIS involvement in understanding social anxiety and co-morbid alcohol use in the current population.

Secondly, participants who had heightened social interaction anxiety, but not social performance anxiety, and co-morbid hazardous alcohol use perceived threats as less escapable. As previously mentioned, this is likely associated with the kind of stimuli feared by these two groups; one comprises largely unavoidable social contact, social interaction, and the other scrutiny and being observed, social performance (Mattick & Clarke, 1998), which may be more readily avoided and able to be ‘escaped’. The perception of threats as less escapable by those with elevated social interaction anxiety appears to hold true in those with co-morbid hazardous drinking. As previously mentioned, individuals with elevated social interaction anxiety are likely to face their feared stimuli frequently as social interaction is considered integral to the daily life of most people (Booth & Hasking, 2009). Given this, one with elevated social interaction anxiety is likely to often face their fears and perceive them as relatively inescapable despite elevated levels of alcohol use.

An unexpected finding was the higher levels of r-BAS in controls when compared to those with heightened social anxiety and co-morbid hazardous drinking. Upon further inspection of the data, it was noted that relative to controls, r-BAS was significantly higher in those with hazardous alcohol use and low social anxiety. Indeed, a significant negative correlation between social anxiety and r-BAS was found indicating that a higher level of social anxiety was associated with reduced appetitive motivation. One possible explanation for this is that the FFFS, underpinning social anxiety, may be inhibiting the function of
the r-BAS in the high social anxiety/hazardous drinking group, yet does not have the same effect in the low social anxiety group in which the FFFS was found to be significantly lower. The contention that the FFFS and r-BIS inhibit the r-BAS when presented with aversive stimuli (Corr, 2004), known as the Joint System's Hypothesis (JSH), is consistent with Kimbrel et al.'s (2010) study which found social interaction anxiety to not only be positively associated with o-BIS sensitivity but negatively related to o-BAS. Another study also found a negative correlation between social anxiety and o-BAS (Kashdan, 2002), however o-BIS was not measured in this study thus inhibiting possible conclusions to be drawn regarding the interplay between RST systems.

In summary, results were the first to assess r-RST, threat perception and defensive behaviour in those with differing levels of social anxiety and alcohol use. Results indicated that there were important distinctions between social interaction and social performance anxieties and hazardous drinking in the way threats are perceived. Moreover, there are differences in the way participants with social interaction anxiety perceive threat when compared to those with co-morbid hazardous alcohol use. Whilst both the social interaction/hazardous alcohol use and social performance anxiety/hazardous alcohol use groups reported higher levels of FFFS, fear, and anxiety, only those with social interaction anxiety and hazardous alcohol use perceived threats as more intense, clearer (less ambiguous) and less escapable. Results also provided information regarding the r-RST systems underpinning social anxiety and hazardous alcohol use. In participants with co-morbid social anxiety and hazardous alcohol use, FFFS, fear and anxiety were elevated which suggests hypersensitivity to threats in the environment and high levels of subjective distress. Finally, r-BAS was found to
be higher in controls than the high social anxiety/hazardous alcohol use group. Similarly, r-BAS was elevated in the hazardous drinkers who had low levels of social anxiety. Results may suggest that FFFS is inhibiting the r-BAS function in the co-morbid group. The relationship between social anxiety, hazardous alcohol use, threat perception and defensive direction suggests that appetitive and aversive motivational processes are implicated in understanding alcohol use in different levels of social anxiety. Appetitive processes appear to be motivating alcohol use in those with lower levels of social anxiety and FFFS whereas aversive processes are seem to be playing a role in motivating alcohol use in individuals with elevated social anxiety. This study has extended upon findings from study one of the current thesis which implicated r-RST in understanding this co-morbidity, but obtaining a clearer understanding of how these variables relate to the perception of threats in the environment.

Threat Perception as Mediators of the Relationship between R-RST and Social Anxiety

Finally, relevant threat perception variables were assessed to analyse the processes through which r-RST, fear and anxiety were related to social anxiety. Results of mediational analyses indicated that threat perception mediated the relationship between FFFS, fear and anxiety and social anxiety. Specifically, data indicated that perceived threat intensity and escapability from threat partially mediated the relationships between fear, trait anxiety and social anxiety. Additionally, the relationship between FFFS and social anxiety was partially mediated by the participant’s perceived level of threat. Notably, the relationship between FFFS and social anxiety was found to be significantly mediated by
perceived level of escapability from threat. The following discussion will focus on this significant mediation in understanding social anxiety.

The results suggest that individuals with heightened levels of FFFS tend to perceive threats as less escapable which in turn may lead to elevated levels of social anxiety. As discussed in chapter one of the current thesis, the FFFS is responsible for mediating responses to aversive stimuli (Corr, 2004; Corr & Perkins, 2006; Smillie, et al., 2006). Indeed, individuals with elevated levels of FFFS sensitivity tended to magnify threats and perceive them as more intense than controls. Further, the FFFS is typically responsible for avoidance and escape behaviours (Corr, 2004; Corr & Perkins, 2006; Smillie, et al., 2006). Specifically, it is said to deal with "dangers that can be explicited escaped or avoided" (McNaughton & Corr, 2004, p. 297), rather than those which may require a cautious approach eliciting the type of approach-avoidance conflict which would activate the r-BIS (Gray & McNaughton, 2000). It seems that in this sample, rather than motivating escape behaviour, the FFFS precipitates an appraisal of threats as inescapable, unavoidable, and confronting. This perception of threat is likely to heighten the panic like symptoms elicited by the elevated FFFS, which may precipitate significant fear, anxiety and impairment in social situations.

In the context of previously mentioned results which found the FFFS to be associated with orientation away from threat, and given the FFFS is the system thought to be responsible for the "get me out of this place" emotion fear (Corr, 2008b; McNaughton & Corr, 2004, p. 10) one would expect orientation away from threat in those with elevated social anxiety. However, results from this significant mediation offer some explanation as to why this was not found in the present sample. As reported, individuals with heightened FFFS perceive threats as
largely inescapable. As previously noted in this discussion, the perception of threats as inescapable (and highly intensive) was found to be associated with the tendency to freeze in response to threat, causing immobility (no defensive orientation). This finding provides an understanding of the motivational processes underpinning social anxiety. Such insights may be utilised in therapeutic environments to assist in intervening prior to the development of a social anxiety disorder. For example, perceptions of threat can be recognised and challenged at a cognitive level in order to reduce the impact of threat perceptions (Segal, Williams, & Teasdale, 2002), particularly relating to escapability, on the relationship between heightened FFFS and social anxiety. Such approaches will be discussed in depth in Chapter Six.

Limitations

There are constraints which limit the extrapolation of findings from the present study. Firstly, it is possible that the scenarios utilised were too threatening to elicit an r-BIS risk assessment. Although the scenarios were designed to facilitate a range of defensive behaviours, this is the second study to suggest that the level of risk may have impacted results associated with regard to the BIS (Perkins & Corr, 2006). Given this, a review of the level of risk in the threat scenarios in future studies is recommended. Similarly, data derived from this study was done so using a cross-sectional design. Whilst causal inferences have been speculated based on theoretical understanding of these relationships, these require longitudinal assessment to determine true causality.

Further, some of the internal consistencies seen in the FFFS and r-BIS subscales of the Jackson 5 (2009) measure were slightly lower than an acceptable level of reliability. Given this, interpretations using these scales need to be made
with caution. Further refinement of this new scale is recommended in future research. In addition, it has been noted that measurement for defensive behaviour contained a greater number of defensive responses that represented orientation towards threat and of a lower level of intensity (see Figure 5.1) (Perkins, et al., 2010) than away from threat and of higher intensity. Consequently variance may have been reduced, causing the lower than adequate levels of reliability observed. Given this, correlations between these factors and other variables may have been reduced.

Furthermore, this sample comprised individuals from a community population and understanding of social anxiety and alcohol use was derived from self report measures. Therefore, it is not clear whether the findings reported here are representative of the motivational processes underpinning those who fulfil the criteria for SAD or the AUDs. Additional replication with a sample of clinically diagnosed SAD and AUDs would allow for extension upon these findings.

There are also mixed views regarding the use of psychometrics to assess RST processes (Avila & Torrubia, 2008; Corr, 2004; Smillie, 2008b), with some researchers arguing that neurobiological approaches are necessary to understand RST (e.g., Smillie, 2008b). By using neurobiological approaches in conjunction with self report measures of r-RST, a greater understanding of social anxiety and co-morbid alcohol use may be obtained.

Finally, whilst gender differences in threat responsiveness were noted in prior studies (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010; Perkins & Corr, 2006), this was not a focus of the current dissertation and was beyond the scope
of the present study. Given this, gender specific conclusions could not be drawn from aggregate data.

The findings from this study should be considered in light of these limitations; despite this, it does offer preliminary support for the role of r-RST, threat perception and defensive behaviours in understanding social anxiety and alcohol use.

Conclusions

The primary aim of the present study was to extend upon study one by employing a threat scenario technique to investigate reactions to threat to establish an understanding of how defensive behaviour and perceptions of threat are related to r-RST systems. Specifically, one purpose of this study was to explore r-RST variables, fear, anxiety, defensive behaviours and threat perception in participants with heightened social anxiety and hazardous alcohol use when compared to controls. The present study also aimed to obtain clarification of the processes mediating the relationship between r-RST and social anxiety. This study was to first to employ the threat scenario methodology in understanding threat behaviour and perception in socially anxious participants, further extending upon this in an attempt to understand the influence of these variables in co-morbid hazardous alcohol use.

Using a fairly simple methodology, results support the contention that there are parallels between rodent and human behaviour (Blanchard, Hynd, et al., 2001). Results also offer support the hypothesis that individual differences in reinforcement sensitivities relate to differential defensive tendencies in the face of threat (Perkins, et al., 2010; Perkins & Corr, 2006). Further, they indicate that
defensive tendencies and perception of threat are related to trait based personality constructs, as is predicted by the revisions to RST (Gray & McNaughton, 2000). Threat responsiveness and defensive behaviour, as measured by threat scenarios (Blanchard, Hynd, et al., 2001), were associated in a way that is largely consistent with r-RST. Results also offer valuable insights into the role of aversive and appetitive motivation in understanding social anxiety and co-morbid alcohol use. Furthermore, this study extended upon prior research by offering an understanding of the way in which individuals with different elements of social anxiety, social performance and social interaction anxiety, perceive threats.
Chapter Six: General Discussion

Overview

The principal aim of this thesis was to obtain a clearer understanding of the motivational processes underpinning social anxiety and hazardous alcohol use in the community by using r-RST as a theoretical framework. Another objective was to extend upon this by exploring the relationships between r-RST, threat perception, and defensive behaviour in understanding social anxiety and hazardous alcohol use.

It has been argued that motivational models frequently used to explain social anxiety and alcohol use (e.g., Carrigan & Randall, 2003; Conger, 1951; Sher & Levenson, 1982) fail to consider the dual role of appetitive and aversive motivational processes. R-RST overcomes this limitation of aversive models as it emphasises individual differences in both appetitive and motivational processes. In addition, revisions to RST clearly delineated fear and anxiety as separable emotions corresponding to two separate, yet interacting, neurological systems which drive defensive direction (Corr, 2011; Gray & McNaughton, 2000); the avoidance of threats or defensive avoidance (FFFS causing the emotional output fear) as well as the cautious approach or risk assessments of threats thought to initiate defensive approach (r-BIS leading to anxiety). It was argued that r-RST may provide a useful framework with which to understanding social anxiety as fear and anxiety are the predominant emotional experiences reported in individuals with elevated social anxiety (Bögels, et al., 2010).

The studies reported in this thesis represent the first attempt to expand the current RST research to apply r-RST, threat perception, and defensive behaviour
in understanding social anxiety and hazardous alcohol use. Another major theoretical contribution of the current thesis was to obtain a clearer understanding of threat perceptions of individuals with social anxiety and hazardous alcohol use and how these factors relate to r-RST and defensive behaviour. Situational factors (e.g., perceived threat intensity, escapability) have been repeatedly demonstrated to be associated with the defensive behaviours of rodents (e.g., Blanchard & Blanchard, 1988; Blanchard, Griebel, et al., 2001; Blanchard & Blanchard, 1989; Blanchard & Blanchard, 1990; Blanchard, et al., 1997); however, they have only more recently been studied in understanding threat responsiveness in humans with results demonstrating parallels across species (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010; Perkins & Corr, 2006). The present thesis drew together research linking o-RST and social anxiety (e.g., Booth & Hasking, 2009; Kashdan & Roberts, 2006; Kimbrel, et al., 2010), hazardous alcohol use (e.g., Franken, 2002; Hundt, et al., 2008; Kambourooulos & Staiger, 2001;2004; Kambourooulos & Staiger, 2007; Loxton & Dawe, 2001), theoretical accounts for the proposed role of r-RST in understanding this comorbidity (Kimbrel, 2008), and defensive behaviour/threat perception research in rodents (e.g., Blanchard & Blanchard, 1989; Blanchard & Blanchard, 1990; Blanchard, et al., 1997) and humans (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010; Perkins & Corr, 2006).

Thus, this study was the first to measure r-RST variables in individuals with social anxiety and hazardous alcohol use (study one), and the first to examine the link between r-RST, threat perception, and defensive behaviour in this population (study two). Together, findings derived from these studies supported the proposal that aversive and appetitive motivational processes as
delineated by r-RST are important in understanding social anxiety and hazardous alcohol use. Further, the relationships between motivational processes, fear, anxiety, threat perception, and defensive behaviour offer a more thorough understanding of the processes through which r-RST systems, fear and anxiety relate to social anxiety and alcohol use. Thus, results from the present thesis have contributed to knowledge regarding the underpinnings of social anxiety and hazardous alcohol use that offers information beyond that provided by other motivational models (e.g., Carrigan & Randall, 2003; Conger, 1951; Sher & Levenson, 1982) or theoretical accounts (Kimbrel, 2008).

The following section will initially summarise the results from the two studies conducted. Secondly, it will discuss the relationships found between r-RST systems, fear, anxiety, threat perception and defensive behaviours. Next, these variables will be explored in understanding the relationships between elevated levels of social anxiety with and without co-morbid hazardous alcohol use when compared to controls. The relationship between fear and anxiety will be then explored, followed by a discussion of the limitations of the thesis, treatment and research implications.

Summary of results

Study One: Investigating R-RST in Understanding Social Anxiety and Alcohol Use in a Community Sample

Study one of the current thesis was designed to investigate the revised RST in understanding elevated levels of social anxiety and hazardous alcohol use in a community population. Further, this study investigated the role of trait fearfulness and anxiety to determine how independent these emotions are, in line
with revisions to RST, in understanding social anxiety. Despite the relevance of r-RST in understanding social anxiety and co-morbid hazardous alcohol use, no studies to date have drawn on the revised model to explore this relationship.

Study one of this thesis makes a number of significant contributions to the RST literature (Corr, 2011; Gray & McNaughton, 2000; Smillie, 2008a) as well as to the understanding of social anxiety and alcohol use. These relationships were explored in light of the revisions to RST and subsequent consideration in the RST literature (Corr, 2011; Gray, 1982; Gray & McNaughton, 2000; Smillie, 2008a). The principal findings derived from study one were as follows:

1) FFFS, but not r-BIS, was significantly higher in those with elevated levels of social anxiety (Jackson, 2009);

2) Freeze was the most important subsystem of FFFS (Jackson, 2009) in predicting social anxiety (Mattick & Clarke, 1998);

3) Fear (Wolpe & Lang, 1977) and trait anxiety (Spielberger, et al., 1983) were found to be significantly higher in participants with heightened social anxiety and co-morbid alcohol use when compared to controls;

4) O-BAS (Torrubia, et al., 2008) and r-BAS (Jackson, 2009) were found to be significantly higher in participants with elevated social anxiety and co-morbid hazardous drinking when compared to elevated social anxiety and non-hazardous drinking. R-BAS was also significantly higher in participants with low social anxiety and hazardous alcohol use when compared to participants with high social anxiety and hazardous alcohol use. When participants with high co-morbidity were compared with those
with low levels of social anxiety and hazardous drinking levels, r-BAS was found to be higher in the latter group;

5) Fear and anxiety were only moderately correlated (27% shared variance). Furthermore, fear and trait anxiety independently predicted unique variance in social anxiety.

In summary, contrary to Kimbrel's (2008) explanatory theory of r-RST for SAD and co-morbid AUDs, data from the current thesis suggests that the combined influence of aversive and appetitive motivational processes are important in understanding social anxiety and hazardous drinking in community samples. This was the first study to empirically assess these variables in individuals with subclinical social anxiety and hazardous alcohol use. Results suggest that r-RST is a useful paradigm in understanding individual differences in the systems underpinning this co-morbidity.

After examining specific elements of r-RST in understanding social anxiety and alcohol use, study two aimed to extend upon the findings of study one by employing a series of threat evoking scenarios to measure threat perception and defensive behaviour. Not only did findings allow for parallels to be drawn between r-RST, threat perception and defensive behaviour, but results also provided an avenue to understand the processes through which r-RST relates to social anxiety and alcohol use. The following section will summarise the relevant findings from study two, emphasising the unique contributions this study has made to the r-RST and social anxiety/alcohol use literature bases. Following this, an integrated discussion comprising findings from both studies will be provided prefacing both clinical and research implications.
Study Two: R-RST, Defensive Distance and Direction and Threat Perception in Understanding Social Anxiety and Alcohol Use

Study two allowed for parallels to be drawn between animal and human research implicating situational threat perception and defensive behaviour in understanding social anxiety and alcohol use. Using threatening scenarios, this study provided an avenue to examine motivational processes involved in understanding this co-morbidity as well as the involvement of ecological variables such as threat perception (e.g., ambiguity, availability for concealment) in understanding appetitive and aversive orientation.

The significant contributions made by study two are fourfold. Firstly, it has contributed to the r-RST literature (Corr, 2002b; 2008b; Corr, 2011; Gray & McNaughton, 2000; Smillie, 2008a) by testing Gray and McNaughton's (2000) revisions using a self-report threat response paradigm. Secondly, it has provided novel information regarding the way individuals with elevated social anxiety perceive threats and how this relates to the r-RST systems found to underpin social anxiety in study one. Thirdly, it allowed for clarification regarding differences in threat perception and defensive behaviour between those with social anxiety only and those who have developed co-morbid problematic drinking behaviours. Finally, study two highlighted differences in threat perception and defensive behaviours between participants with social interaction and social performance anxieties. Such findings may have important treatment implications.

Findings pertaining to study two are as follows:
1) With regard to defensive behaviours, Fight and r-BAS (Jackson, 2009) were associated with defensive direction (Blanchard, Hynd, et al., 2001) towards threat, whereas Flight, Freeze, and fear (Wolpe & Lang, 1977) were correlated with the tendency to orientate away from threatening stimuli. Flight was the only variable measured to be associated with a more intense state response to threat;

2) Participants with elevated levels of Flight, Freeze, fear and anxiety magnified threat intensity;

3) Freeze, trait anxiety (Spielberger, et al., 1983) and fearfulness were negatively correlated with the perception of threats as escapable;

4) R-BIS was positively associated with perceived ambiguity in the threat scenarios;

When compared to controls:

1) Individuals with high social interaction anxiety perceived threats as more intense, less escapable, and more proximal. There were no differences between the high social performance anxiety group and controls for all threat perception variables;

2) Participants with elevated social interaction anxiety and co-morbid hazardous drinking and elevated social performance anxiety and co-morbid alcohol use reported higher levels of FFFS, fear and trait anxiety. Relative to controls participants with social interaction anxiety, but not social performance anxiety, perceived threats as more intense, less escapable and less ambiguous;
3) The perception of threats as less escapable significantly mediated the relationship between FFFS and social anxiety.

**The Relationship between R-RST, Threat Perception and Defensive Behaviours**

There has been a renewed interest in the RST literature in understanding defensive behaviours to stimuli which elicit conditioned and unconditioned state reactions (Perkins, et al., 2010; Perkins & Corr, 2006). The current thesis not only provided an understanding of traits in relation to r-RST but it also assessed state responsiveness to threats, as measured using the same methodology performed in prior research in this area (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010; Perkins & Corr, 2006). Finally, the present study allowed for the measurement of threat perception to determine how these relate to r-RST, fear and anxiety. The second study then built on this by obtaining an understanding of how these factors relate to social anxiety and alcohol use. Firstly, findings relating to threat perception, defensive behaviour, and defensive distance and how they relate to the recent revisions to RST will be discussed.

**R-RST and Threat Perception**

The relationships between r-RST and threat perception were largely consistent with predictions derived from an understanding of r-RST (Gray & McNaughton, 2000). The finding that FFFS, Flight and Freeze positively correlated with the tendency to magnify threats is consistent with the theoretical account of the FFFS as the system responsible for mediating responses to punishment stimuli (Corr, 2002b; Gray & McNaughton, 2000). This study has also demonstrated a link between trait levels of FFFS sensitivity, and state responses to threat. Specifically, responses to the threatening vignettes indicated
a greater propensity to perceive threats in the environment as FFFS levels increased.

This behaviour is consistent with those seen in rodents presented with a predator and observed through a series of tunnels (Blanchard & Blanchard, 1989). Specifically, rodents have been observed fleeing when escape is possible and freezing when there is no available escape (Blanchard & Blanchard, 1989). This suggests that there are parallels between animal and human responses to threat and that these responses relate to the trait measurement of FFFS.

Another finding was that consistent with revisions to RST was the positive correlation between r-BIS and perceived ambiguity in the threat scenarios. In rodents, risk assessment behaviour such as breathing the air to obtain olfactory information, or auditory or visual scanning of the environment have been demonstrated when there is an ambiguous threat present (e.g., the smell of a predator). This behaviour performs the function of analysing the environment to determine whether approach (r-BAS) or avoidance (FFFS) is necessary. Whilst this finding was weak in strength, it was in line with the conceptualisation of r-BIS in r-RST.

**Defensive Direction and Defensive Intensity**

Revisions to RST assert that defensive behaviour is dependent upon defensive direction which distinguishes between threats which elicit fear and avoidance (e.g., a ferocious dog) and those which require appetitive behaviour (e.g., a baby near a ferocious dog) (Gray & McNaughton, 2000; Perkins, et al., 2010). In the latter scenario, a risk assessment is conducted and the situation
evaluated prior to movement, which is thought to implicate the r-BIS (Corr, 2011; Gray & McNaughton, 2000).

Data partially supported predictions pertaining to defensive behaviour as specified in r-RST (Gray & McNaughton, 2000), as fear and elements of FFFS, Flight and Freeze, were associated with orientation away from threat. Anxiety was not correlated with orientation toward threat as was expected. This was consistent with the finding that r-BIS was not related to defensive direction. Interestingly, this is the third study to find no correlation between anxiety and defensive direction using the same methodological approach (Perkins, et al., 2010; Perkins & Corr, 2006). Further research using alternative methodologies (e.g., psycho-pharmacological research) may offer further understanding of this process in humans.

Differences between revised and original BIS highlight changes to the conceptualisation of these variables (Gray & McNaughton, 2000). Whilst r-BIS is the subsystem hypothesised to be responsible for mediating goal conflict, o-BIS was conceptualised as a system which was sensitive to threat, intensive and inherent fear stimuli. In terms of defensive behaviour, it was the o-BIS which was considered to be responsible for eliciting aversive motivation away from conditioned stimuli (Corr, 2011; Gray & McNaughton, 2000). This role is now attributed to the FFFS. Given this, the finding the o-BIS and FFFS, but not r-BIS, was associated with aversive movement is congruent with the theoretical conceptualisation of these systems. Results may also suggest that the extent to which an individual evaluates goal conflict is not important in understanding orientation towards or away from threat.
Fight and r-BAS were associated with orientation towards threatening stimuli. Interestingly, Fight was not correlated with perceived distance from threat or perceived escapability, as a fight response is typically seen in rodents when threat is proximal and inescapable (Blanchard, et al., 1989). Despite this, it is intuitive that one must approach a threat to fight. This result again offers an understanding of the relationship between trait tendencies to fight in response to threat, and state self-report behaviour in response to threatening stimuli. Results suggest that r-BAS motivates appetitive behaviour towards threatening stimuli. Thus, results suggest that in order to fight a perceived threat, an individual may need to have an active appetitive system. Thus, the rewarding reinforcement associated with the appetitive/fight behavioural response to threat may be the resolution of the threat. By approaching the threat through the fight response the punishing stimuli is removed and non-punishment may become the rewarding stimuli.

Whilst r-BAS was associated with orientation towards threat, o-BAS was not a significant correlate of defensive direction. This finding offers further support for the contention that there are differences in conceptualisation of the BAS that go beyond the introduction of the inclusion of sensitivity to unconditioned stimuli (Gray & McNaughton, 2000). Based on data from study one it was argued that o-BAS has been considered the system responsible for eliciting fast access to positive affect in response to rewarding stimuli (Torrubia, et al., 2001). However, r-BAS encapsulates elements of BAS thought to be required for sustained approach behaviours such as seeking out rewarding stimuli in the environment (Jackson, 2009); a behaviour which may require sustained approach behaviour and tolerance for discomfort for long term gain (e.g.,
approaching the threat may serve to resolve anxious worry or inhibits the punishing stimuli leading to positive feels associated with non-punishment). By measuring RST constructs in addition to defensive behaviour, study two was able to demonstrate differences between the revised and original conceptualisations of BAS in predicted behavioural outcomes in response to threat.

Finally, Flight was the only variable found to be associated with a higher intensity response to threat. In the context of other possible responses to threat, namely Fight, this is an interesting finding. This result is likely to be associated with the sample utilised, of which 73% were women. Gender differences have been found in past research which is congruent with findings from the current study. Specifically, Perkins and Corr (2006) observed female participants to be significantly more likely to orientate away from threat and respond to threats with greater intensity when compared to their male counterparts; this finding was also replicated in Perkins et al.‘s (2010) data. Thus, results pertaining to defensive intensity may have differed if gender was delineated; however, this was beyond the scope of the current research.

**Defensive Distance**

Finally, defensive distance is considered to be an important element in understanding threat responses. Defensive distance specifies that responses to threats are conditional upon the perception of the proximity of the threat in relation to the individual (Eilam, 2005). Threats perceived to be proximal or extreme in magnitude, are hypothesised to activate lower neural networks such as the periaqueductal gray which elicit automatic responses such as fight, flight, and freezing. The more distal a threat is perceived to be, the higher neural networks are increasingly implicated evoking more complex and considered responses (i.e.,
risk assessment, rumination) (Corr, 2008b). Interestingly, the only variable associated with defensive distance was social interaction anxiety. Specifically, levels of social interaction anxiety was positively correlated with levels of perceived proximity to threat. The suggestion that lower neural networks are typically implicated in proximal threats is an interesting proposition when considering social anxiety, which at the upper end of the continuum is thought to be a complex anxiety disorder which involves frontal neural networks (Furmark, et al., 2002; Tillfors, Furmark, Marteinsdottir, & Fredrikson, 2002). However, in light of other findings this proposition is plausible in this largely subclinical sample. For example, individuals with heightened social interaction anxiety reported significantly higher levels of FFFS and fear than controls. Moreover, there were no differences for r-BIS which is thought to be involved in understanding complex anxiety (Gray & McNaughton, 2000). Thus, in this subclinical group more lower level processes may be implicated in motivating defensive behaviour.

**R-RST, Threat Perception and Defensive Behaviour; a Model for Understanding Social Anxiety and Alcohol Use**

Whilst study one was the first to investigate the role of r-RST as a framework for understanding social anxiety and alcohol use, study two built upon this by finding distinct differences in the way individuals with social interaction anxiety and social performance anxiety perceive threat stimuli. Specifically, both studies indicated that FFFS, fearfulness and trait anxiety were significantly heightened in individuals with elevated social interaction and performance anxieties in two large community samples. Whilst findings relating to FFFS, fear and anxiety were consistent across studies, results relating to r-BAS were less
consistent. R-BAS was found to be positively associated with alcohol use in
study one, but this was not replicated in study two. Further, in study two r-BAS
was significantly higher in controls when compared to individuals with
heightened social anxiety and alcohol use; a finding which was not predicted
based on theoretical accounts of r-RST processes (Corr, 2011; Gray &
McNaughton, 2000; Smillie, et al., 2006), and is inconsistent with research
implicating o-BAS in understanding hazardous alcohol use (e.g., Booth &
Hasking, 2009; Franken, 2002; Hundt, et al., 2008; Kambouropoulos & Staiger,

When defensive behaviours were investigated in study two, striking
between-group differences were found. Specifically, participants with heightened
social interaction anxiety and hazardous alcohol use were found to magnify
threats, reporting them as more intense than controls, perceive threat as less
ambiguous (clear threat) and less escapable than controls; however, no such
differences were found between the social performance anxiety/hazardous drinker
group and controls. Finally, the perceived level of escapability from threat was
found to significantly mediate the relationship between FFFS and social anxiety.

Across the two studies, results pertaining to r-RST, social anxiety and
alcohol use were largely consistent. Specifically, in both studies FFFS, fear and
trait anxiety were significantly higher in participants with elevated social anxiety
and alcohol use. This finding is congruent with the revised conceptualisation of
RST in which the FFFS has replaced the o-BIS as the system hypothesised to
mediate responses to aversive stimuli and is responsible for fearfulness (Gray &
McNaughton, 2000; Smillie, et al., 2006). Study two provided insight into the
processes involved in understanding the relationship between FFFS and social
anxiety. Results from study two suggest that social anxiety in the current sample was not only associated with threat perception in relation to social interactions, but feeling as though one cannot escape from threats in general. Further, the perception of threats as inescapable in part responsible for the relationship between FFFS and social anxiety as evidenced by a significant mediation. These results help to clarify the aetiological and perpetuating processes associated with social anxiety. Specifically, results suggest that for socially anxious individuals, the FFFS is implicated in motivating escape behaviour due to a hyperactive threat detection system in addition to an appraisal of threats as inescapable, unavoidable, and confronting. This perception of threat as less escapable is likely to escalate fear like panic symptoms elicited by the FFFS, which may exacerbate elevated levels of fear and impairment in social situations.

In addition, study one found that Freeze was the most important r-RST variable to predict social anxiety. Indeed, studies have shown that socially anxious individuals report freeze like behaviours ranging in severity from thought blocking to disassociation in response to social stimuli (Beidel, et al., 1985; Wells, et al., 1996). A freeze response may be observed as disengagement from conversation and or behaving in a nonresponsive manner in social situations. Individuals with SAD report heightened awareness of perceived social deficits (such as feeling frozen and unable to contribute to the social interaction/performance) and cognitive distortions regarding appraisals from others; thus, the tendency to freeze in response to threats is likely to perpetuate anxiety experienced in social situations and confirm self beliefs associated with social inadequacy (Rapee & Heimberg, 1997). Moreover, freezing in response to threat does not provide an opportunity for physical escape or conflict resolution.
Rather it serves as a psychological escape which does not allow for the re-evaluation of threat perception which could potentially lead to habituation to the threatening stimuli.

In animals, freezing is typically a defensive response conducted prior to being spotted by a predator or threat, or when escape is impossible and the threat proximal (Eilam, 2005). Indeed, results derived from study two indicated that individuals with elevated levels of FFFS perceive threats as intense and less escapable. Moreover, individuals with social interaction anxiety perceived threats as more intense and proximal than controls. Results suggest that in the case of socially anxious individuals, the perception of threats as close and largely inescapable is the most probable explanation for this behaviour as the suggestion that one freezes prior to being spotted by a predator suggests forethought and anxious anticipation. The process of freezing prior to the onset of a threat, as suggested by Eilam (2005), is likely to activate the r-BIS to perform an evaluation of the threat stimuli and risk assessment. Rather, results in both of the studies within this thesis suggested that the FFFS, responsible for fear responses, was the only r-RST system associated with socially anxious individuals, indicating a more reflexive automatic behavioural response to threat rather than the more cautious risk assessment type response thought to activate the r-BIS.

The clear and consistent finding across both studies that r-BIS was not implicated in understanding social anxiety was incongruent with hypotheses and the current theoretical conceptualisations of r-RST in understanding G-SAD (Kimbrel, 2008). These predictions were based upon the notion that social situations provide elements of threat and reward which are predicted to elicit the kind of approach-avoidance conflict thought to be implicated in an r-BIS risk
assistance (Corr, 2004; Gray & McNaughton, 2000). The inexistence of a relationship between r-BIS and social anxiety was an interesting finding, particularly in light of the elevated levels of trait anxiety found in those with heightened social anxiety in both studies. It is suggested that the absence of an association between r-BIS and social anxiety may be due to a number of factors. Firstly, results may reflect an absence of goal conflict experienced by those with elevated social anxiety in these samples. Indeed, research has suggested that community samples of individuals with subclinical social anxiety more readily avoid precipitants to social anxiety (Merikangas, et al., 2002); thus, potentially bypassing the requirement to perform an evaluative risk assessment. Given this, individuals may not frequently be faced with the situation where they must reconcile a conflict between having to approach a situation which may offer some form of reward which concurrently causes them discomfort. Moreover, it is also plausible that heightened FFFS sensitivities preponderates any potential conflict from the r-BAS negating the need to conduct a risk assessment. That is, their sensitivity to environmental threat outweighs any reactivity to reward in social situations. Further, it is possible that the new r-BIS measure (Jackson, 2009) did not successfully capture the complex r-BIS construct effectively. Collectively, results from the two studies indicate that conflict resolution measured by the r-BIS is not as relevant in understanding social anxiety in this sample as is general trait anxiety.

Whilst FFFS, fear and anxiety were significantly higher for participants with elevated levels of social interaction anxiety and social performance anxiety when compared with controls, there were differences in the way threat was perceived by these two groups. Specifically, consistent with the nature of social
interaction as a largely unavoidable behaviour (Booth & Hasking, 2009) participants with heightened social interaction anxiety perceived threatening stimuli as intense, less escapable and more proximal than controls. These results may suggest that individuals with elevated social interaction anxiety experience significant distress in social situations as they perceive threatening stimuli to be closer and less escapable than those with lower levels of this anxiety. For example, an individual with social interaction anxiety may enter into a classroom full of people, due to their underlying hyperactive threat detection systems (FFFS) they perceive this environment to be highly threatening, they feel that the threat is close and that they cannot escape from this environment; consequently they experience overwhelming feelings of fear and anxiety.

Threat perception (e.g., perceived level of threat, escapability, ambiguity) was not important in understanding social performance anxiety; this result was consistent when individuals with social performance anxiety and hazardous alcohol use was compared with controls. These results may be due to the more specific nature of the feared stimuli in those with social performance anxiety which can be more readily ‘escaped’ or avoided and as such are not perceived to be highly intense or proximal. Despite the biological sensitivity to threatening stimuli in individuals with social performance anxiety, as evidenced by heightened FFFS, they do not report elevated levels of the more consciously aware perceptual biases (e.g., perceived level of threat, escapability, ambiguity). This distinction in threat perception appears to be a significant factor distinguishing social performance and social interaction anxiety.

Whilst findings pertaining to FFFS and r-BIS were consistent across the two studies, mixed results were found with regard to r-BAS functioning. Study
one focused on the differences in o-BAS and r-BAS whereas study two focused
upon understanding r-RST in relation to defensive behaviour; both studies
investigated r-RST in understanding social anxiety and hazardous drinking.
Study one reported that o-BAS and r-BAS were significantly positively correlated
with alcohol use. Whilst there was a significant positive relationship between o-
BAS and alcohol use in study two, the same was not found for r-BAS.
Additionally, in study one r-BAS was found to be significantly higher in the co-
morbid social anxiety/hazardous alcohol group when compared to those with
social anxiety only; however there were no differences between these groups for
r-BAS in study two. Finally, group differences in o-BAS and r-BAS were also
found between hazardous drinkers when compared to controls, with r-BAS
contributing only a small amount of variance in understanding alcohol use.
Interestingly, in study two r-BAS but not o-BAS was associated with orientation
towards threat, a finding which was consistent with differences found between r-
BAS and o-BAS in motivating alcohol use in study one.

Results appear to indicate that o-BAS and r-BAS are representative of
distinct motivational processes. Specifically, the r-BAS is thought to mediate
responses to all appetitive stimuli rather than just conditioned stimuli as was
originally proposed (Gray, 1982; Gray & McNaughton, 2000). R-BAS remains
the system activated by reward or anticipation of pleasure thought to initiate
appetitive behaviour towards stimuli that will be reinforced by positive affect
(Gray & McNaughton, 2000). This was supported by the finding in study two
which implicated r-BAS, but not o-BAS, in understanding defensive direction.
Furthermore, the measure of o-BAS utilised in the present study appears to
contain elements of rash impulsivity (e.g., —Do you sometimes do things for quick
gains?”), a behaviour which motivates appetitive behaviour towards immediate rewards. The Jackson (2009) r-RST measure, appears to encapsulate items that motivate more considered orientation toward rewards that may be appropriate if the reward is distal (e.g., “-look for new sensations”). Thus it seems that these two measures are capturing different aspects of BAS processes. This proposition may offer an avenue for future consideration.

Collectively results suggest that the pleasurable feelings associated with experiencing rewards once they have been received are more important in motivating alcohol use than the underlying drive to seek out and orientate towards rewarding stimuli. This is consistent with prior research as the o-BAS has been found to positively correlate with hazardous drinking in adults, secondary and university samples (Franken, 2002; Knyazev, 2004; Loxton & Dawe, 2001; O’Conner & Colder, 2005), and found to predict increased noticing and responding to alcohol related cues (Franken, 2002; Kambouropoulos & Staiger, 2001; 2004). This thesis was the first known to the author to investigate r-RST or Jackson’s (2009) r-RST measure in hazardous alcohol users.

Both studies were consistent in finding elevated r-BAS in controls when compared to individuals with high social anxiety and hazardous drinking. Furthermore, an unexpected finding showed that the r-BAS was significantly higher in hazardous drinkers in individuals with lower levels of social anxiety when compared to individuals with high levels of social anxiety and alcohol use. These results appear to suggest that antagonistic processes are implicated in understanding r-BAS functioning in hazardous drinkers for individuals with heightened social anxiety. This will be discussed in more detail below in the relation to the Joint Subsystems Hypothesis.
Significant relationships pertaining to r-BAS and alcohol use in study one, but not study two, cannot be attributed to the characteristics of these two samples as they were highly similar. Both samples comprised more females than males (study one 63%, study two 73% females), with a mean age in the early thirties (study one $M=29.93$, $SD = 10.15$, study two $M=33.27$, $SD =11.25$), most of whom worked at a full time or part time capacity. Both studies also only comprised approximately 20% of participants who identified as being a student. Moreover, scores on the AUDIT were similar across samples (study one: $M=9.42$, $SD= 6.79$; study two: $M= 8.58$, $SD= 6.49$). Given this, the samples are comparable in terms of their composition. However, study one had more than twice as many participants as study two ensuring significant power to detect small relationships between r-BAS and other variables which may not have been found in the smaller study two sample. Indeed, group differences found for r-BAS in study two had small effect sizes and the relationship between r-BAS and alcohol use was weak in strength. These results suggest that there are weak trends in hypothesised directions which were captured using the large sample; they were not strong enough to be replicated when a smaller sample was utilised.

In all, results highlight the importance of r-RST constructs and threat perception in understanding social anxiety and co-morbid alcohol use. Valuable insights into differences between the original and revised conceptualisations of RST were obtained which provided a greater understanding of social anxiety and hazardous alcohol use.
The Role of the Joint Systems Hypothesis (JSH) in Understanding Social Anxiety and Alcohol Use.

Whilst not specifically predicted in hypotheses of either study, data suggested that there might be interplay between appetitive and aversive motivational process. Specifically, both studies found r-BAS to be lower in the high social anxiety group, which were found to have significantly higher levels of FFFS sensitivity. Moreover, study two indicated that r-BAS was significantly higher in hazardous drinkers when social anxiety was low. Results are consistent with effects proposed to be exerted under certain circumstances explained by the JSH (Corr, 2001;2004). The JSH purports that responses to threat and aversive motivation will be highest in individuals with high levels of threat sensitivity (e.g., FFFS) and low levels of reward reactivity (e.g., BAS). Thus, the FFFS/r-BIS activation elicited by the aversive stimuli impedes r-BAS function and activation. Similarly, rewarding stimuli activates the r-BAS which inhibits the function of the FFFS and r-BIS (Corr, 2002a;2004). This effect is proposed to be only pertinent to understanding processes under certain conditions.

The converse hypothesis has been labelled the Separable Subsystems Hypothesis (SSH) which purports that responses to aversive and appetitive stimuli function independent of each other (Corr, 2002a;2004). That is, r-BAS activation from potentially rewarding stimuli (e.g., alcohol use) should, according to the SSH, be the same regardless of levels of FFFS. Similarly, FFFS activation in response to aversive stimuli (e.g., giving a speech) should occur regardless of levels of r-BAS (Corr, 2002a). Most studies in the RST literature have assumed independence of RST systems (Corr, 2001). Indeed, independence in RST function is said to be found when strong aversive and/or appetitive stimuli are
used, when individuals tested are high in punishment and/or reward sensitivity, in
situations where there is combination of appetitive and aversive stimuli, and
where there is no need for quick shifts in attention or behaviour between
appetitive and aversive stimuli (Corr, 2004).

A small number of prior studies have also suggested that the JSN was
implicated in understanding social anxiety and alcohol use (Hundt, et al., 2008;
Ju-Yu, et al., 2009; Kashdan, 2002; Kimbrel, et al., 2010; Pardo, et al., 2007). In
one such study, researchers indicated that that low o-BAS in addition to high o-
BIS was implicated in understanding social interaction, but not social
performance, anxiety (Kimbrel, et al., 2010). Another reported that o-BAS was
negatively associated with social anxiety; however, despite the obvious
application of o-BIS in understanding social anxiety, researchers did not
investigate this system in this study (Kashdan, 2002). It is widely accepted in the
alcohol use literature that o-BAS is positively associated with alcohol use, a
notion that is supported by an abundance of literature (e.g., Kambouropoulos &
Staiger, 2001;2007; Loxton & Dawe, 2001; Voigt, et al., 2009). Furthermore, a
small number of studies have found weak negative relationships between o-BIS
and alcohol use (e.g., Kimbrel, et al., 2010). Collectively, results indicate that in
some instances both aversive and appetitive processes are implicated in
understanding social anxiety and alcohol use. However, until recently these
findings have been in disparate research areas. The present study has linked RST
research pertaining to social anxiety and alcohol use, indicating that r-BAS
function may be inhibited in those with heightened social anxiety/FFFS.
Fear and Anxiety in Understanding R-RST and Social Anxiety

Results from both studies were also consistent in finding only moderate correlations between fear and anxiety. Further, the present study found fear and anxiety to predict unique variance in the understanding of social anxiety, thought to be an ideal dependent variable as these emotional experiences are common symptoms of SAD (Rapee & Heimberg, 1997).

Results are consistent with a small number of studies which have concluded that fear and anxiety could be considered separable constructs (Cooper, et al., 2007; Perkins, et al., 2007). In particular, using a different methodology results were consistent with Perkins et al.'s study that found fear and trait anxiety to be only moderately correlated, distinctively related to Eysenck's (1967) neuroticism, and associated in a face valid manner with outcomes on a fear related military training combat task. Furthermore, Cooper et al. (2007) used CFA to demonstrate that trait fearfulness and anxiety loaded onto individual factors. Results from both studies offer further evidence that fear and anxiety are related yet different constructs.

Data derived from study two indicated that whilst individuals with high levels of fearfulness and trait anxiety perceive threatening situations in a similar manner, as highly intense and inescapable, they respond to threats in a distinct manner. This finding offers insights into the distinct nature of defensive direction for individuals with high levels of these trait emotions. Specifically, results suggest that those with higher levels of trait fearfulness tend to run or hide from threats; thus, not allowing the opportunity for a risk assessment and potentially a re-evaluation of the threat which may downgrade the perception of threat intensity, allow for a resolution to be obtained (e.g., confront the threat, have the
predator recede), or allow for habituation to innocuous feared stimuli. Contrary to this finding, high trait anxious individuals neither orientated towards or away from threat. One possibility for this finding is that trait anxious individuals make a more cautious decision regarding defensive orientation, thus were unable to determine whether they would approach or retreat when faced with immediate threats. However, risk assessment behaviour in those with high trait anxiety would involve r-BIS input which was not detected in either study of this thesis. Despite this, as previously discussed, it is possible that goal conflicts were not fully captured within the r-RST measure utilised, and further research is required to investigate the relationship between r-BIS and anxiety to aid clarification regarding this proposed relationship. Another explanation for the finding that anxiety is not associated with defensive direction as individuals who are highly trait anxious tend to freeze when presented with threatening stimuli. Indeed, there was a moderately strong relationship between Freeze and trait anxiety.

Finally, the finding that fear and anxiety are uniquely associated with social anxiety has implications for the way social anxiety is treated. Often interventions such as relaxation strategies are used to reduce anxiety symptomatology (Eppley, Abrams, & Shear, 1989). However, clinically, such techniques have been shown to provoke panic and fear like symptoms in anxious clients (Braith, McCullough, & Bush, 1988; Heide & Borkovec, 1983; Wegner, Broome, & Blumberg, 1997). Results from the present study, in conjunction with the previously mentioned studies which have reported upon the separability of fear and anxiety, highlight the need to address both fear and anxiety symptoms in socially anxious clients. For example, exposure based techniques in conjunction with relaxation, social skills training and cognitive therapy (Segal, et al., 2002;
Witkiewitz, Marlatt, & Walker, 2005) are likely to provide a holistic methodology which considers heightened fear, heightened anxiety, social anxiety and social skills deficits, and perceptual biases such as threat intensity and escapability.

**Implications of This Thesis**

Obtaining an understanding of heightened social anxiety and hazardous drinking in the community has important implications for clinical assessment and intervention. This is particularly important in the context of these largely Australian samples as early intervention for common mental health concerns is increasingly being accessed since the introduction of government subsidised treatment via the 'Better Access to Mental Health Initiative' (Hickie, et al., 2010). According to data sought in December 2009, two million people had accessed subsidised mental health treatment through this scheme: Almost 60% of which were referred for treatment of an anxiety disorder and approximately 5% for alcohol or other drug use. The 'Better Access' program has served to bridge a gap in health care needs between costly private mental health services and the public sector tailored to address the needs of the acute. This service has seen greater adoption of psychological treatment earlier in the development of mental health issues (Hickie & Groom, 2002), thus highlighting the need to obtain a clearer understanding of factors implicated in understanding these conditions in the non-acute range of the clinical spectrum.

This is particularly important in the context of findings which have implicated r-RST personality constructs in understanding elevated, but not necessarily clinical, levels of social anxiety and alcohol use, as it has been argued that matching personality traits to interventions may improve treatment outcomes (Staiger, Kambouropoulos, & Dawe, 2007). It has also been suggested that
individual differences in personality may predispose people to be sensitive to the reinforcement properties of ecological rewards (e.g., alcohol) and punishments (e.g., anxiety) (Watt, Stewart, Conrod, & Schmidt, 2008). By obtaining an understanding of these constructs when assessing treatment seeking individuals, interventions can be targeted specifically to potentially produce better outcomes (Staiger, et al., 2007; Watt, et al., 2008).

For example, results derived from this thesis indicated that underlying personality vulnerabilities, such as heightened sensitivity to aversive stimuli as indicated by elevated FFFS levels, make one more susceptible to developing social anxiety. Furthermore, individual differences in the degree to which one experiences positive affect in response to reward appears to be a factor underpinning the development of hazardous co-morbid alcohol use with or without high levels of FFFS. Finally in people without an underlying hypersensitivity to punishment stimuli but who have an increased tendency for appetitive motivational behaviour towards rewards appear to be more likely to engage in problematic alcohol use. Thus, treatment seeking individuals with heightened FFFS may benefit from exposure based behavioural therapies to allow them to desensitise and habituate to their fears: Social anxiety, trait anxiety and associated fearfulness may reduce as a consequence in individuals with this sensitivity (Hayes, Hope, & Heimberg, 2008). In people presenting to therapy due to social anxiety and co-occurring hazardous alcohol use, results suggest that it would be beneficial to have an understanding of the appetitive and aversive processes motivating their behaviour. With individuals whom report high levels of FFFS and o-BAS, mindfulness based exposure therapies (e.g., Mindfulness Based Cognitive Therapy (MBCT), Mindfulness Based Relapse Prevention;
Kocovski, Fleming, & Rector, 2009; Segal, et al., 2002; Witkiewitz, et al., 2005) may serve dual roles: 1) exposing the individual to interoceptive fear cues associated with social anxiety while improving emotional regulation and focused attention (Goldin & Gross, 2010), and 2) providing an alternative rewarding experience to the hazardous drinker potentially dampening impulsive tendencies often seen in reward sensitive individuals (Staiger, et al., 2007; Witkiewitz, et al., 2005). In hazardous drinkers with low levels of FFFS, and high levels of r-BAS (and likely o-BAS), treatments such as Mindfulness Based Relapse Prevention have been demonstrated to reduce alcohol use and problematic consequences related to substance use (Witkiewitz, et al., 2005).

An additional consideration to be assessed and integrated into treatment protocols is the way in which personality influences threat perception. This is equally important as understanding personality characteristics as threat perceptions reflect a cognitive appraisal or response to threatening stimuli which may also be directly targeted in treatment. For example, results indicated that participants with heightened FFFS were more likely to feel trapped or unable to escape from threats in their environments which lead to social anxiety. The particular element of the FFFS found to predict social anxiety was the tendency to freeze in response to threat. In this example, the cognitive perception of threats as inescapable appears to be perpetuating the tendency to freeze in response to threat which hinders an opportunity to habituate to the threat stimuli due to cognitive avoidance. Thus previously mentioned treatments (e.g., MBCT) may serve to address general sensitivity to aversive stimuli, in conjunction to using cognitive techniques to challenge and replace unrealistic perceptions of threats in their environment (Segal, et al., 2002). Perhaps with such treatment, people with
elevated social anxiety may develop the skills required to implement cognitive appraisals of situations which elicit a realistic risk assessment. An interesting area for future treatment is to determine if r-BIS is implicated in understanding the process of commencing and progressing through therapy.

Finally, results suggest that fear and anxiety are separable in understanding social anxiety. That is, the association between fear and anxiety indicates that these constructs, while related, are certainly not identical in terms of measurement. Given this, assessing individual differences in trait levels of fearfulness and anxiety may offer information regarding techniques utilised in the treatment of social anxiety with or without hazardous alcohol use. Differing treatments are often used to treat fear (e.g., exposure, panicolytics) and anxiety (e.g., relaxation, anxiolytics). Given this, the highly fearful individual may avoid relaxation exercises due to increased awareness of interoceptive emotions which induce feelings of panic (Heide & Borkovec, 1984; Knott, Bakish, Lusk, & Barkely, 1997; Wells, 1990). However, based on the current findings we know that fear and anxiety are both elevated in people with social anxiety, and they influence social anxiety in a unique way. Given this, it appears that socially anxious individuals are likely to benefit from the integration of techniques addressing both fearfulness and anxiety into their treatment protocol.

There are also research implications of the present study which was the first to apply r-RST to a sample of individuals to investigate social anxiety and alcohol use. This study has provided a preliminary understanding of the role of aversive and appetitive motivational processes in understanding social anxiety and alcohol use. Further, it has extended upon this to investigate the perception of ecological variables typically seen to influence rodent defensive behaviour and
more recently human behaviour. Whilst a number of limitations were
acknowledged, and recommendations made for future research, future studies
investigating r-RST, threat perception, and/or defensive behaviour in
understanding social anxiety and alcohol use may build upon the findings of this
novel research.

Limitations of this Thesis and Directions for Future Research

There are several limitations to the present thesis that merit discussion and
have implications for future research. Firstly, data derived from this study was
done so using a cross-sectional design. Whilst causal inferences have been made
based on theoretical understanding of the relationships between measured
variables, these require longitudinal assessment in order to establish true
causality.

Other methodological issues relate to the measures utilised. As reported,
r-BIS was not found to be associated with variables which would be predicted
using the r-RST paradigm (Gray & McNaughton, 2000). It was suggested that
one possible explanation for this finding was due to difficulty capturing goal
conflicts in psychometric measurement. For example, the threat scenarios utilised
in study two may have been perceived to be too threatening by participants to
evoke a risk assessment. Indeed, Perkins and Corr (2006) suggested in their study
utilising this measure that threat intensity may have impacted findings pertaining
to o-BIS. Given this, a review of r-BIS measurement is recommended in future
research.

In addition, some of the internal consistencies seen in the FFFS and r-BIS
subscales of the Jackson 5 (2009) measure, and the defensive behaviour scores
derived from the threat scenarios (Blanchard, Hynd, et al., 2001) were slightly lower than an acceptable level of reliability. Consequently, interpretations using these scales need to be made with caution. Further refinement of these new scales is recommended in future research. Additionally, it has been noted that measurement of defensive behaviour contained a greater number of defensive responses that represented orientation towards threat and of a lower level of intensity (see Figure 5.1) (Perkins, et al., 2010) than away from threat and of higher intensity. This may have reduced variance, causing the lower than adequate levels of reliability observed and may have reduced correlations between these variables. Furthermore, it is acknowledged that multiple comparisons were made in each study which may have increased the chance of type one error.

The present research aimed to obtain a clearer understanding of social anxiety and alcohol use in a community population. Whilst social anxiety is considered to be a continuum whereby SAD is close to the upper end (Boone, et al., 1999; Rapee & Spence, 2004; Tillfors, et al., 2004), elevated levels of social anxiety are not specifically synonymous with a diagnosis of SAD as one may experience significant social anxiety yet not allow it to interfere with their daily functioning (APA, 2000). Therefore, it is not clear whether the findings reported here are representative of the motivational processes underpinning those who fulfil the criteria for social anxiety disorder. Additional replication with a sample of clinically diagnosed SAD and AUDs would allow for extension upon results derived from the current thesis.

Furthermore, whilst gender differences have been found in studies which have investigated defensive behaviours and threat perception in human
populations (Blanchard, Hynd, et al., 2001; Perkins, et al., 2010; Perkins & Corr, 2006) and in differences in responsiveness to questions regarding the Jackson "Right" subscale have been noted, investigating sex differences in understanding these variables was considered to be beyond the scope of the present thesis.

Finally, whilst it has been argued that r-RST constructs, threat perception, and defensive behaviours are implicated in understanding social anxiety and alcohol use, data was collected using self report measures. There are mixed views regarding the use of psychometrics to assess RST processes. In his review of r-RST, Corr (2004) argued that "direct measures [of RST] are no more biological than less direct measures such as behavioural or verbal responses" (p. 322). Similarly, Avila and Torrubia (2008) acknowledge that neurobiological paradigms need to be integrated into the already established RST literature base, yet highlight the importance of the self report approach stating that "questionnaires are still the most useful method to assess individual differences in personality (p.386)."

Alternatively, Smillie (2008b) has argued that the self report methodology of measuring r-RST may reflect the output or consequences of these systems rather than serving as proxies for measurement of the systems themselves. He purported that other methodologies, namely, neuroimaging, pharmacological, and psychogenomic research (described by Corr 2008 as a method used to derive an understanding the genetic underpinning of psychological processes), may be more objective approaches which directly measure reinforcement sensitivity systems. There are, however, a number of limitations associated with such approaches (e.g., cost, specificity, expertise) which may hinder development of research in this area (see Smillie, 2008b for a review); despite this, it is acknowledged that such technologies offer potential
avenues for advancement in understanding r-RST should these limitations be overcome. Whilst such approaches are likely to provide state responses to threat and incentives, Corr (2008a) argues that they fail to capture individuals differences in trait personality variables – a crucial element integral to the understanding of personality and emotion. Whilst, researchers have advocated the use of self report measures in understanding RST constructs (e.g., Avila & Torrubia, 2008; Corr, 2004; 2008a), future research integrating neurological/biological approaches may provide an avenue to operationalise r-RST constructs on a state level. Integrating these research paradigms appears to be the way forward in measuring r-RST. By using neurobiological approaches in conjunction with self report measures of r-RST, a greater understanding of social anxiety and co-morbid alcohol use may be obtained. The current research has established a building block on which hypotheses for such research can be explored.

**Conclusion**

By employing r-RST, the current thesis aimed to investigate motivational processes in understanding social anxiety and alcohol use in the community. Another objective was to extend upon this by exploring the relationships between r-RST, threat perception, and defensive behaviour in understanding social anxiety and hazardous alcohol use. This thesis has contributed to the RST literature by addressing the dearth of research investigating the dual aversive and motivational processes in understanding alcohol use and social anxiety. Despite the applicability of r-RST in understanding social anxiety and co-morbid social anxiety, the RST literature relating to these two conditions has remained largely distinct. In addition, due to issues relating to r-RST measurement (Smillie,
2008a), most studies have continued to investigate the original theory 11 years after Gray and McNaughton’s (2000) revisions were published. Whilst one study to date has investigated original RST constructs (o-BIS and o-BAS) in relating to understanding this co-morbidity, this thesis is the first to measure the delineated FFFS, r-BIS systems in addition to the revised r-BAS via a trait self-report measure (Jackson, 2009) in addition to state responses to threatening scenarios (Blanchard, Hynd, et al., 2001). It was also the first to demarcate specific components of the FFFS system in understanding social anxiety. It offered novel findings by integrating r-RST processes, threat perception, and defensive responsiveness to understanding social performance, social interaction anxiety, and hazardous alcohol use. Finally, it offered further support for the contention that fear and anxiety are separable constructs.

In summary, aversive and motivational processes appear to influence the development of social anxiety and co-morbid alcohol use. The FFFS, in particular the Freeze system, predicted social anxiety. The relationship between FFFS and social anxiety can, in part, be explained by the perception that escape from threat is unavailable. Results provided an understanding of the personality profile of individuals with social anxiety from an RST perspective. Individuals with heightened social interaction and performance anxiety tend to be highly sensitive to aversive or punishing stimuli and are highly anxious and fearful. For those with heightened social performance anxiety, ecological variables typically seen to influence the defensive behaviour of rodents (Blanchard & Blanchard, 1989) were not important. In contrast, individuals who are fearful and anxious when presented with social interaction tend to magnify threat intensity, feel as though they cannot escape from the threatening situation, and perceive danger to
be highly proximal. For people with social interaction anxiety who partake in
hazardous alcohol use threats are not considered to be proximal and they conclude
that the threats are clear and apparent. Results from the current study were the
first to offer distinct methods through which FFFS and threat perception relate to
different categories of social anxiety.

Results suggest that the positive affective experience obtained once a
reward has been received (o-BAS) is an important motivator of hazardous alcohol
use in individuals with social anxiety. For individuals with lower levels of social
anxiety and FFFS the drive to reduce temporo-spatial distance between their
current position and this rewarding stimulus (r-BAS) is also important in
motivating hazardous alcohol use.

In linking theoretical accounts of motivational processes underpinning
social anxiety and alcohol use, this thesis has provided novel understanding of the
appetitive and aversive processes underpinning the development of social anxiety
and hazardous alcohol use. By using r-RST as a paradigm to obtain a clearer
understanding of personality traits underlying social anxiety and hazardous
alcohol use, valuable insights were obtained regarding underlying sensitivities to
punishment and rewarding stimuli, threat perception, and defensive behaviour in
these individuals. As was expected, due to the complexities of measuring
—functional outcomes” of neurobiological systems (Smillie, et al., 2006, p. 327),
questions have been raised and problems identified to address in future research.
Despite this, it is hoped that this thesis advances our knowledge of the
motivational processes underpinning social anxiety and hazardous drinking.
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(Social Anxiety Disorder)

A. A marked and persistent fear of one or more social or performance situations in which the person is exposed to unfamiliar people or to possible scrutiny by others. The individual fears that he or she will act in a way (or show anxiety symptoms) that will be humiliating or embarrassing. Note: In children, there must be evidence of the capacity for age-appropriate social relationships with familiar people and the anxiety must occur in peer settings, not just in interactions with adults.

B. Exposure to the feared social situation almost invariably provokes anxiety, which may take to the form of a situationally bound or situationally predisposed Panic Attack. Note: In children, the anxiety may be expressed by crying, tantrums, freezing, or shrinking from social situations with unfamiliar people.

C. The person recognizes that the fear is excessive or unreasonable. Note: In children, this feature may be absent.

D. The feared social or performance situations are avoided or else are endured with intense anxiety or distress.

E. The avoidance, anxious anticipation, or distress in the feared social or performance situation(s) interferes significantly with the person’s normal routine, occupational (academic) functioning, or social activities or relationships, or there is marked distress about having the phobia.

F. In individuals under age 18 years, the duration is at least 6 months.
G. The fear or avoidance is not due to the direct physiological effects of a
substance (e.g., a drug of abuse, a medication) or a general medical condition
and is not better accounted for by another mental disorder (e.g., Panic
Disorder With or Without Agoraphobia, Separation Anxiety Disorder, Body
Dysmorphic Disorder, a Pervasive Developmental Disorder, or Schizoid
Personality Disorder).

H. If a general medical condition or another mental disorder is present, the fear
in Criterion A is unrelated to it, e.g., the fear is not of Stuttering, trembling in
Parkinson's disease, or exhibiting abnormal eating behaviour is Anorexia
Nervosa or Bulimia Nervosa.

Specify if: Generalised: if the fears include most social situations.
Appendix B: DSM-IV-TR (APA, 2000) Diagnostic Criteria for Substance Dependence

A maladaptive pattern of substance use, leading to clinically significant impairment or distress, as manifested by three (or more) of the following, occurring at any time in the same 12 month period:

(1) Tolerance, as defined by either of the following:
   (a) A need for markedly increased amounts of the substance to achieve intoxication or desired effect
   (b) Markedly diminished effect with continued use of the same amount of the substance

(2) Withdrawal, as manifested by either the following:
   (a) The characteristic withdrawal syndrome for the substance
   (b) The same (or similar) substance is taken to relieve or avoid withdrawal symptoms

(3) The substance is often taken in larger amounts or over a longer period than was intended

(4) There is a persistent desire or unsuccessful efforts to cut down or control substance use

(5) A great deal of time is spent in activities necessary to obtain the substance (e.g. visiting multiple doctors or driving long distances), use the substance (e.g. chain smoking), or recover from its effects

(6) Important social, occupational, or recreational activities are given up or reduced because of substance use
(7) Substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance (e.g. continued drinking despite recognition that an ulcer was made worse by alcohol consumption).
Appendix C: DSM-IV-TR Diagnostic Criteria for Substance Abuse

A. A maladaptive pattern of substance use leading to clinically significant impairment or distress, as manifested by one (or more) of the following, occurring within a 12-month period:

1. Recurrent substance use resulting in a failure to fulfil major role obligations at work, school, or home (e.g. repeated absences or poor work performance related to substance use; substance-related absences, suspensions, or expulsions from school, neglect of children or household)

2. Recurrent substance use in situations in which it is physically hazardous (e.g. driving an automobile or operating a machine when impaired by substance use)

3. Recurrent substance related legal problems (e.g. arrests for substance related disorderly conducts)

4. Continued substance use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance (e.g. arguments with spouse about consequences of intoxication, physical fights)

B. The symptoms have never met the criteria for Substance Dependence for this class of substance.
Appendix D: Research Questionnaire

DEAKIN UNIVERSITY
PLAIN LANGUAGE STATEMENT AND CONSENT FORM

TO: Participant

Plain Language Statement

Date: 20/12/2010

Full Project Title: Understanding the motivational processes underlying alcohol use and social anxiety: the role of threat responsiveness.

Principal Researcher: Dr Nicolas Kambouroypoulos
Associate Researcher: Dr Petra Staiger
Student Researcher: Ms Sarah Egan

This Plain Language Statement and Consent Form is 3 pages long. Please make sure you have all the pages.

1. Your Consent
You are invited to take part in this research project. This project is being conducted as part of the Doctor of Psychology (Clinical) program running via Deakin University.

This Plain Language Statement contains detailed information about the research project. Its purpose is to explain to you as openly and clearly as possible all the procedures involved in this project so that you can make a fully informed decision whether you are going to participate.

Please read this Plain Language Statement carefully. Feel free to ask questions about any information in the document by contacting Sarah Egan at steg@deakin.edu.au. You may also wish to discuss the project with a relative or friend or your local health worker. Feel free to do this.

Once you understand what the project is about and if you agree to take part in it, you will be asked whether you agree to participate after having read through the Plain Language Statement. Due to the online administration of the questionnaire, if you agree you will be directed to the start of the questionnaire. You do not need to sign a Consent Form as your consent is implied once you submit your questionnaire responses. You are free to withdraw from the study at any time in which case your responses will not be submitted.
By agreeing to participate, completing the questionnaire and submitting your responses online to the secure Deakin server, you indicate that you understand the information and that you give your consent to participate in the research project.
2. Purpose and Background
The purpose of this project is to investigate motivational processes involved in drinking alcohol for people who experience different levels of social anxiety. This research is being completed in partial fulfilment of the thesis requirement for the Doctor of Clinical Psychology at Deakin University.

A total of 250 adults will participate in this project. The project is only open to individuals aged 18 years or over.

Some individuals who experience social anxiety may be more likely to drink alcohol. As yet we do not fully understand the relationship between social anxiety and alcohol use. Examining motivational processes for drinking can assist in explaining this link.

The results of this research may be used to help researcher, Sarah Egan, to obtain a Doctor of Psychology degree.

3. Funding
This research is totally funded by Deakin University.

4. Procedures
Participation in this project will involve spending approximately 15 minutes completing an online questionnaire accessible from any location with internet access. Once you read this Plain Language Statement you can choose to access the questionnaire via the URL link provided below.

Once you read this Plain Language Statement and access the URL, you will see a copy of this Plain Language Statement on the internet and then be able to click whether you ‘agree’ with the statement. Upon clicking the link, you will be transferred to the online questionnaire. Participants can then complete the questionnaire items and submit their responses to a secure password protected Deakin web server. Sarah Egan will be monitoring the web server to determine how many participants have taken part thus determine the conclusion of data collection.

Examples of items included in the questionnaire include: “Are you a shy person?”, “I fear I may blush when I am with others” and “How often do you have a drink containing alcohol?”

5. Possible Benefits
Participation in this research is voluntary and we cannot guarantee or promise that you will receive any direct benefits from this project. However, participants may find the content of the research questions interesting.

6. Possible Risks
It is unlikely that you will experience any psychological pain or discomfort as a result of taking part in this study, however in the event that you experience emotional discomfort during or after the completion of the questionnaire you are encouraged to contact either a counselling service or Lifeline on 13 11 14. If you have concerns regarding your drinking behaviour, you may wish to contact Direct Line on 1800 888 236.
7. **Privacy, Confidentiality and Disclosure of Information**

Any data you supply will be stored on a secure password protected computer and locked cabinet at Deakin University for a minimum of six years from the date of the research publication. Your responses will not be identified as research participation is anonymous.

8. **Results of Project**

It is possible that the results of the study may be published in a scientific journal however individual responses will not be identifiable as only group data will be submitted. A summary of the major findings will be available in February, 2011. If you would like a summary of the results, please contact the student researcher Sarah Egan at steg@deakin.edu.au.

9. **Participation is Voluntary**

Participation in any research project is voluntary. **If you do not wish to take part you are not obliged to.** If you decide to take part and later change your mind, you are free to withdraw from the project at any stage in which event your participation in the research will immediately cease and any information obtained by you will not be used. However, you must be aware that because the online questionnaire is anonymous, you will not be able to withdraw once you have submitted your responses.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with Deakin University or the researcher conducting this project. You are not obliged in any way to participate.

Before you make your decision, a member of the research team will be available to answer any questions you have about the research project. You can ask for any information you want. Register your consent by agreeing to the Plain Language Statement and completing the questionnaire only after you have had a chance to ask your questions and have received satisfactory answers.

10. **Ethical Guidelines**

This project will be carried out according to the National Statement on Ethical Conduct in Human Research (2007) produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies.

The ethics aspects of this research project have been approved by the Human Research Ethics Committee of Deakin University.

11. **Complaints**

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

Secretary HEAG-H, Deans Office, Faculty of Health, Medicine, Nursing and Behavioural Sciences 221 Burwood Highway, Burwood Victoria 3125
Telephone: 9251 7174, Email hmnbs-research@deakin.edu.au.

Please quote project number HEAG-H 136/10.

12. **Reimbursement for your costs**

You will not be paid for your participation in this project.
13. **Further Information, Queries or Any Problems**

If you require further information or if you have any problems concerning this project (for example, any side effects), you can contact the principal researcher or the student researcher. The researchers responsible for this project are:

Ms Sarah Egan and Dr Nicolas Kambouropoulos  
School of Psychology  
Faculty of Health, Medicine, Nursing and Behavioural Sciences  
Deakin University  
221 Burwood Highway  
Burwood, 3125  
03 9244 6876

_Thank you for your time, it is greatly appreciated._
Demographic Information

1. Age: _____ years

2. Gender:
   - [ ] Male
   - [ ] Female

3. What is your relationship status?
   - [ ] Single (never married)
   - [ ] Casual partner
   - [ ] Steady partner
   - [ ] Married or living with a partner
   - [ ] Separated or divorced
   - [ ] Widowed

4. What is your current employment status?
   - [ ] Unemployed
   - [ ] Employed casually/ part time
   - [ ] Employed full-time
   - [ ] Student
   - [ ] Pensioner/retiree
   - [ ] Stay at home parent
   - [ ] Other (please specify): ____________________

5. Country of birth: _______________
Threatening Scenarios

You will be asked to read the following scenarios which contain threatening situations. After each one you will be asked to rate them according to your perception of them (e.g., how threatening you think they are) and also asked to nominate your first response to a list of common behaviours.

1. You are walking along in an isolated but familiar area when a menacing stranger suddenly jumps out of the bushes to attack you.

2. You are alone in an elevator late at night. As it stops and the doors open, a menacing stranger rushes in to attack you, blocking the door.

3. You are alone in a car on your way home. While stopped at a traffic signal, an angry stranger begins banging on your car window and yelling threatening things at you.

4. Driving along a two-lane road, you see in your rear-view mirror that a car is dangerously tailgating you. They cannot pass and begin honking their horn aggressively at you while continuing to follow too closely.

5. It is past midnight and you are walking through an unfamiliar part of town. As you round a corner, you accidently run into a man. He becomes angry and shoves you.

6. You and someone you do not really know that well are standing around and talking in an empty parking lot. The acquaintance begins to shove and push you. You are unsure whether s/he (same sex as you) is serious or just kidding around.

7. You are outside in a park area at night when you see a menacing stranger with a
knife about 30ft (about 9 metres) away directly approaching you. It is obvious the person is planning to attack you.

8. You are alone as you exit an empty campus building late one night. Just as you get outside, you feel a hand grab your arm.

9. You are sleeping in bed during the night, but suddenly wake up thinking you have heard a suspicious noise. It is dark and you are alone.

10. You are alone at home one night about to go to bed when the phone rings. You answer it, and there is an unfamiliar voice on the other end. It tells you that they are right outside your house and hangs up.

11. Coming home one day, you find an unexpected shoe-box-sized package waiting for you by the mailbox. As you sit down to open it, you notice a faint ticking sound that appears to come from inside the package.

12. Alone at home one night, you have settled down to read a book when you hear some movement right outside of your window. You cannot see anything, but when you listen more closely, it sounds like people whispering.

**Threat Perception:**

Please rate on the following scale your perception of the threatening scenario that you have just read:

<table>
<thead>
<tr>
<th></th>
<th>Not threatening</th>
<th>Highly threatening</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>How threatening was this situation?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inescapable</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>-------------</td>
</tr>
<tr>
<td>2</td>
<td>How escapable was this situation?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Very Close</th>
<th>Very Far</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>How close/far was the threat to you?</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Very ambiguous</th>
<th>Not ambiguous at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>How ambiguous was this situation?</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Nowhere to hide/concealment</th>
<th>Clearly somewhere to hide/concealment</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>How available was the opportunity to hide/concealment?</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
Response options:

Please check the first thing you might do if in this scenario:

1. Hide

2. Freeze

3. Run away, try to escape, remove self

4. Threaten to scream or call for help

5. Yell, scream, or call for help

6. Threaten to attack

7. Attack or struggle

8. Check out, approach or investigate

9. Look for something to use as a weapon

10. Beg, plead for mercy, or negotiate

AUDIT

Scored – items 1-8:

- 0 = "Never" - 4 = "4 or more times a week"

Items 9 & 10:

- 0 = "No"
- 2 = "Yes, but not in the last year"
- 4 = "Yes, during the last year"
Please circle the answer that is correct for you during the last 12 months

1. How often do you have a drink containing alcohol?

NEVER  MONTHLY  2-4 TIMES  2-3 TIMES  4 OR MORE
          OR LESS  A MONTH   A WEEK       TIMES A WEEK

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

1 OR 2  3 OR 4  5 OR 6  7 TO 9  10 OR MORE

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

NEVER  LESS THAN  MONTHLY  WEEKLY  DAILY OR
              MONTHLY                ALMOST DAILY

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

NEVER  LESS THAN  MONTHLY  WEEKLY  DAILY OR
              MONTHLY                ALMOST DAILY

5. How often during the last year have you found that you were not able to stop drinking once you had started?
### Social Anxiety and Alcohol Use

<table>
<thead>
<tr>
<th>Never</th>
<th>Less Than Monthly</th>
<th>Weekly</th>
<th>Daily or Almost Daily</th>
</tr>
</thead>
</table>

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

<table>
<thead>
<tr>
<th>Never</th>
<th>Less Than Monthly</th>
<th>Weekly</th>
<th>Daily or Almost Daily</th>
</tr>
</thead>
</table>

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

<table>
<thead>
<tr>
<th>Never</th>
<th>Less Than Monthly</th>
<th>Weekly</th>
<th>Daily or Almost Daily</th>
</tr>
</thead>
</table>

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

<table>
<thead>
<tr>
<th>Never</th>
<th>Less Than Monthly</th>
<th>Weekly</th>
<th>Daily or Almost Daily</th>
</tr>
</thead>
</table>

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

<table>
<thead>
<tr>
<th>No</th>
<th>Yes, But Not In The Last Year</th>
<th>Yes, During The Last Year</th>
</tr>
</thead>
</table>

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

<table>
<thead>
<tr>
<th>No</th>
<th>Yes, But Not In The Last Year</th>
<th>Yes, During The Last Year</th>
</tr>
</thead>
</table>
The Social Interaction Anxiety Scale

Scored (SIAS/SPS):

- 0 = "Not at all" to 4 = "Extremely"
- Reverse scored – item 8 & item 10 (SIAS)
- Nil reverse scored in SPS

*Indicate the degree to which you feel the statement is characteristic or true of you.*

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Very</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

1. I become anxious if I have to write in front of other people
2. I become self-conscious when using public toilets
3. I can suddenly become aware of my own voice and of others listening to me
4. I get nervous that people are staring at me as I walk down the street
5. I fear I may blush when I am with others
6. I feel self-conscious if I have to enter a room where others are already seated
7. I worry about shaking or trembling when I’m watched by other people
8. I would get tense if I had to sit facing other people on a bus or a train
9. I get panicky that others might see me to be faint, sick or ill
10. I would find it difficult to drink something if in a group of people
It would make me feel self-conscious to eat in front of a stranger at a restaurant

I am worried people will think my behaviour odd

I would get tense if I had to carry a tray across a crowded cafeteria

I worry I'll lose control of myself in front of other people

I worry I might do something to attract the attention of others

When in an elevator I am tense if people look at me

I can feel conspicuous standing in a queue

I get tense when I speak in front of other people

I worry my head will shake or nod in front of others

I feel awkward and tense if I know people are watching me

Social Performance Scale

*Indicate the degree to which you feel the statement is characteristic or true of you.*

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Very</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

1. I get nervous if I have to speak with someone in authority (teacher, boss etc.)

2. I have difficulty making eye-contact with others

3. I become tense if I have to talk about myself or my feelings
4 I find difficulty mixing comfortably with the people I work with

5 I tense-up if I meet an acquaintance in the street

6 When mixing socially I am uncomfortable

7 I feel tense if I am alone with just one other person

8 I am at ease meeting people at parties, etc.

9 I have difficulty talking with other people

10 I find it easy to think of things to talk about

11 I worry about expressing myself in case I appear awkward

12 I find it difficult to disagree with another’s point of view

13 I have difficulty talking to attractive persons of the opposite sex

14 I find myself working that I won’t know what to say in social situations

15 I am nervous mixing with people I don’t know well

16 I feel I’ll say something embarrassing when talking

17 When mixing in a group I find myself worrying I will be ignored

18 I am tense mixing in a group

19 I am unsure whether to greet someone I know only slightly

The Jackson-5: Scales for measuring Revised Reinforcement Sensitivity

Theory (r-RST)

Scored:
• 1 = "Completely disagree" to 5 = "Completely agree"

*Indicate the degree to which you feel the statement is characteristic or true of you.*

1 = Completely disagree

2 = Disagree

3 = Undecided

4 = Agree

5 = Completely agree

1. I like to do things which are new and different.

2. I aim to do better than my peers

3. I would fight back if someone hit me first.

4. If approached by a suspicious stranger, I run away.

5. If something very bad was just about to happen to me, I would just stop.

6. I like to do things spontaneously.

7. I want to do well compared to my peers

8. When provoked, I easily get into a fight.

9. I am likely to run if harassed by a stranger in an unfamiliar place.

10. If I got scared in my bed at night, I would remain motionless

11. I actively look for new experiences
I like my peers to know I am doing well

If a burglar broke into my house, I would immediately look for a weapon.

If a dog barks at me, I would run away.

I don’t know what to say if a stranger is rude to me in the street.

I have a feel for how things work.

I prefer to work on projects where I can prove my ability to others.

If I caught somebody stealing my belongings, I would attack.

If the fire alarm rang, I immediately rush out of the building.

If my boss told me to do two contradictory things, I would not know what to do.

I look for new sensations.

I want to avoid looking bad.

If I think somebody is going to hit me, I hit them first.

I can’t help but feel terrified if I see a dangerous animal.

If there is a choice of products in a shop, I find it hard to decide what to buy.

I am excited by what is new in my field.

I avoid work that makes me look bad.

If somebody does something bad to me, I would retaliate.

I used to hide behind a chair as a child when I watched a frightening TV show.

In a crowd, my mind freezes and then I never know what to say.
Sensitivity to Punishment and Sensitivity to Reward Scale

- Scored - 0 = "No", 1='Yes'

Please answer each question by ticking the “Yes” or the “No” box following the

**Question:**

1. Does the prospect of obtaining money motivate you strongly to do some things?
2. Do you prefer not to ask for something when you are not sure you will obtain it?
3. Are you often afraid of new or unexpected situations?
4. Is it difficult for you to telephone someone you do not know?
5. Do you often do things to be praised?
6. Do you like being at the centre of attention at a party of a social meeting?
7. In tasks that you are not prepared for, do you attach great importance to the possibility of failure?
8. Do you spend a lot of time on obtaining a good image?
9. Are you easily discouraged in difficult situations?
10. Are you a shy person?
11. When you are in a group, do you try to make your opinions the most intelligent or funniest?
12. Whenever possible, do you avoid demonstrating your skills for fear of being embarrassed?
13. Do you often take the opportunity to pick up people you find attractive?
14. When you are with a group, do you have difficulties selecting a good topic to talk about?
15. As a child, did you do a lot of things to get people’s approval?
16. Does the possibility of social advancement move you to action, even if this involves not playing fair?
17. Do you think a lot before complaining in a restaurant if your meal is not well prepared?
18. Do you generally give preference to those activities that imply an immediate gain?
19. Do you often have trouble resisting the temptation of doing forbidden things?
20. Whenever you can, do you avoid going to unknown places?
21. Do you like to compete and do everything you can to win?
22. Are you often worried by things that you said or did?
23. Would it be difficult for you to ask your boss for a raise (salary increase)?
24. Do you generally try to avoid speaking in public?
25. Do you, on a regular basis, think that you could do more things if it was not for your insecurity or fear?
26. Do you sometimes do things for quick gains?
27. Comparing yourself to people you know, are you afraid of many things?
28. Does your attention easily stray from your work in the presence of an attractive stranger?
29. Do you often find yourself worrying about things to the extent that performance in intellectual abilities is impaired?
30. Are you interested in money to the point of being able to do risky jobs?
31. Do you often refrain from doing something you like in order not to be rejected or disapproved by others?
32. Do you like to be competitive in all of your activities?
33. Would you like to be a socially powerful person?
34. Do you often refrain from doing something because of your fear of being
embarrassed?
35. Do you like displaying your physical abilities even though this may involve danger?

**STAI Form Y-2**

Scored:

- 1 = "Almost never" to 4 = "Almost always"
- Items 1, 3, 6, 7, 10, 13, 14, 16, 19 reverse scored

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

1 = Almost never

2 = Sometimes

3 = Often

4 = Almost always

1  I feel pleasant.................................................................

2  I feel nervous and restless..............................................

3  I feel satisfied with myself.............................................

4  I wish I could be as happy as others seem to be......................
5 I feel like a failure

6 I feel
   rested

7 I am —*m, cool, and collected*

8 I feel that difficulties are piling up so that I cannot overcome them

9 I worry too much over something that really doesn’t matter

10 I am happy

11 I have disturbing thoughts

12 I lack self-confidence

13 I feel secure

14 I make decisions easily

15 I feel inadequate

16 I am content

17 Some unimportant thought runs through my mind and bothers me

18 I take disappointments so keenly that I can’t put them out of my mind

19 I am a steady person

20 I get in a state of tension or turmoil as I think over my recent concerns and interests

**Fear survey schedule**

Scored:
- 0 = "Not at all" to 4 = "Very much"

The items in this questionnaire to things and experiences that may cause fear or other related unpleasant feelings. Read each item and decide how much you are disturbed by it. Then mark your response according to the following scale.

If an item generally leads you to feel no fear, mark the box 0 (not at all). If you would feel a little fear, mark number 1 (A little). If you feel more afraid, mark a higher number – 2 (a fair amount), 3 (Much), or 4 (Very much) – depending on your response to the item. Remember to mark only one of the spaces after each item. Answer all the items.

Please work rapidly and do not spend too much time on any one statement.

Example:

65. Harmless snakes

0 – Not at all – I may feel disgusted but I am not at all nervous or fearful when I see a harmless snake at the zoo.

1 – A little – I occasionally feel slightly anxious when I see a harmless snake at the zoo.

2 – A fair amount – I feel upset and anxious when I see a harmless snake at the zoo.

3 – Much – I feel very nervous, my heart beats faster, I want to get away when I see a harmless snake at the zoo.

4 – Very much – I feel very afraid, I run away, pass out when I see a harmless snake at the zoo.
0 = not at all

1 = a little

2 = a fair amount

3 = much

4 = very much

1. Noise of vacuum cleaners
2. Open wounds
3. Being alone
4. Loud voices
5. Dead people
6. Speaking in public
7. Crossing streets
8. Being in a strange place
9. Falling
10. Automobiles
11. Being teased
12. Dentists
13. Thunder
14. Sirens
15. Failure
16. Entering a room where other people are already seated
17. High places on land
18. Looking down from high buildings
19. Worms
20. Imaginary creatures
21. Receiving injections
22. Strangers
23. Bats
24. Journeys by train
25. Feeling angry
26. People in authority
27. Flying insects
28. Seeing other people injected
29. Sudden noises
30. Journeys by car
31. Dull weather
32. Crowds
33. Cats
34. One person bullying another
35. Tough looking people
36. Birds
37. Sight of deep water
38. Being watched working
39. Dead animals
40. Weapons
41. Dirt
42. Journeys by bus
43. Crawling insects
44. Seeing a fight
45. Fire
46. Sick people
47. Being criticized
48. Strange shapes
49. Being touched by others
50. Being in an elevator
51. Witnessing surgical operations
52. Angry people
53. Mice or rats
54. Human blood
55. Animal blood
56. Parting from friends
57. Enclosed places
58. Prospects of surgical operation
59. Feeling rejected by others
60. Journeys by airplane
61. Medical odors
62. Feeling disapproved of
63. Harmless snakes
64. Cemeteries
65. Being ignored
66. Darkness
67. Premature heart beats (missing a beat)
68. Nude men
69. Nude women
70. Lightning
71. Doctors
72. Making mistakes
73. Looking foolish
74. Losing control of yourself
75. Fainting
76. Becoming nauseous
77. Harmless spiders
78. Being responsible for decisions
79. Sight of knives or sharp objects
80. Thoughts of being mentally ill
81. Taking written tests
82. Being with a member of the opposite sex
83. Large open spaces
84. Dogs
85. Germs
86. Being seen unclothed
87. Taking medicine
88. Being punished by god
89. Being dressed unsuitably (wearing wrong clothes for the occasion)
90. Ministers or priests
91. Hurting the feelings of others
92. Kissing
93. Undertakers
94. Police
95. Fish
96. Leaving home
97. Physical examinations
98. Marriage
99. Insecticides
100. Vomiting
101. Responsibility (being in charge)
102. Hospitals

Thank you for your participation!