SENSATION SEEKING MODERATES THE RELATIONSHIP BETWEEN ALCOHOL USE AND RISK APPRAISAL

by

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Abstract

Personality traits, such as sensation seeking and impulsivity, have been linked to substance use, as well as risk and benefit appraisal. Risk appraisal has also been inversely related to substance use, and is lower at higher levels of experience (i.e., familiarity) with the substance. This study examines the relationship between alcohol use and perceived risks and benefits, as moderated by sensation seeking, while controlling for impulsivity. Undergraduate students completed online questionnaires examining their perceptions of risks and benefits for several activities as well as their level of engagement in those activities, personality traits (sensation seeking and impulsivity), and measures of substance use. There was an inverse relationship between alcohol use (i.e., familiarity with alcohol) and risk appraisal, and this relationship was moderated by Experience Seeking. Other sensation seeking scales did not show the same relationship. Individuals lower on Experience Seeking showed a stronger inverse relationship between alcohol use and perceived risks compared to benefits. Those higher on Experience Seeking had a non-significant relationship between alcohol use and net risk appraisal, indicating that their perception of risks compared to benefits remained relatively constant regardless of their past use of alcohol. This relationship also extended to the use of cannabis, where those lower on Experience Seeking showed a stronger negative relationship between past cannabis use and net risk appraisal of cannabis, compared to those higher on the trait. Likewise, individuals lower on Disinhibition also showed a stronger negative relationship between past cannabis use and net risk appraisal of cannabis, compared to those higher on the trait.
# TABLE OF CONTENTS

Abstract .......................................................................................................................... ii

Table of Contents .......................................................................................................... iii

List of Tables ................................................................................................................ vii

List of Figures ................................................................................................................ vi

Acknowledgements ........................................................................................................ vii

1 Introduction ................................................................................................................ 1
   1.1 Risk Appraisal ........................................................................................................ 2
   1.2 Substance Use and Disinhibited Personality ....................................................... 5
   1.3 Risk Appraisal and Disinhibited Personality ....................................................... 6
   1.4 Substance Use, Risk Appraisal, and Personality ................................................ 10
   1.5 Present Study ........................................................................................................ 10

2 Method .......................................................................................................................... 13
   2.1 Participants .......................................................................................................... 13
   2.2 Personality Measures .......................................................................................... 13
      2.2.1 Sensation seeking measure ........................................................................... 13
      2.2.2 Impulsivity measure .................................................................................... 14
   2.3 Substance Use Measures ..................................................................................... 15
      2.3.1 Alcohol use measure .................................................................................... 15
      2.3.2 Drug use measure ....................................................................................... 16
   2.4 Risk Appraisal Measures ..................................................................................... 16
   2.5 Procedure ............................................................................................................ 18
   2.6 Statistical Analysis .............................................................................................. 20

3 Results .......................................................................................................................... 21
   3.1 Net Risk Appraisal of Alcohol Use for Self ......................................................... 21
   3.2 Mortality Risk Ratings for Alcohol Use ............................................................... 22
   3.3 Net Risk Appraisal of Cannabis Use for Self ...................................................... 23
   3.4 Net Risk Appraisal of Alcohol Use for Peers ....................................................... 24

4 Discussion ...................................................................................................................... 26
   4.1 Experience Seeking ............................................................................................... 26
   4.2 Thrill and Adventure Seeking .............................................................................. 28
   4.3 Disinhibition ......................................................................................................... 29
   4.4 Boredom Susceptibility ....................................................................................... 30
   4.5 BIS-11 Total Score .............................................................................................. 31
   4.6 Risk to Peers ....................................................................................................... 31
   4.7 Limitations and Future Directions ........................................................................ 32
      4.7.1 Cross-sectional and self-report methods ...................................................... 32
      4.7.2 Online administration ................................................................................. 33
      4.7.3 Ethnicity and culture ................................................................................... 33
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conclusions</td>
<td>33</td>
</tr>
<tr>
<td>Tables</td>
<td>35</td>
</tr>
<tr>
<td>Figures</td>
<td>41</td>
</tr>
<tr>
<td>References</td>
<td>44</td>
</tr>
<tr>
<td>Appendices</td>
<td>54</td>
</tr>
<tr>
<td>Appendix A</td>
<td>54</td>
</tr>
<tr>
<td>Appendix B</td>
<td>58</td>
</tr>
<tr>
<td>Appendix C</td>
<td>60</td>
</tr>
<tr>
<td>Appendix D</td>
<td>64</td>
</tr>
<tr>
<td>Appendix E</td>
<td>65</td>
</tr>
<tr>
<td>Appendix F</td>
<td>75</td>
</tr>
<tr>
<td>Appendix G</td>
<td>77</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1  Means and Standard Deviations for all Variables.................................35

Table 2  First Order Correlations.......................................................................36

Table 3  Hierarchical Regression Model Predicting Net Risk Appraisal of Alcohol Use for Self as moderated by the interaction of Sensation Seeking Scale-V subscales and Past Year Alcohol Consumption.................................................................37

Table 4  Hierarchical Regression Model Predicting Mortality Risk Appraisal of Alcohol Use for Self as moderated by the interaction of Sensation Seeking Scale-V subscales and Past Year Alcohol Consumption.................................................................38

Table 5  Hierarchical Regression Model Predicting Net Risk Appraisal of Cannabis Use for Self as moderated by the interaction of Sensation Seeking Subscales and Past Cannabis Use........................................................................................................39
LIST OF FIGURES

Figure 1  Experience Seeking Interacts with Alcohol Use in the Prediction of Net Risk
          Appraisal of Alcohol Use to Self.................................................................41

Figure 2  Disinhibition Interacts with Alcohol Use in the Prediction of Mortality Risk Rating
          of Alcohol Use...............................................................................................42

Figure 3  Sensation Seeking Subscales Interact with Cannabis Use in the Prediction of Net
          Risk Appraisal of Cannabis Use to Self.........................................................43
          3.1  Experience Seeking....................................................................................43
          3.2  Disinhibition...............................................................................................43
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1 Introduction

Higher levels of disinhibited personality traits, compared to lower levels, have long been seen as a risk factor for alcohol and drug use. Sensation seeking (Arnett, 1994; Zuckerman, 1979b) and impulsivity (e.g., Dawe & Loxton, 2004; Petry, 2001; Sher & Trull, 1994; Slutske et al., 2002; Tarter et al., 2003) are disinhibited personality traits commonly linked to substance use and appear to be related to a biological vulnerability to alcoholism (Krueger et al., 2002; Young, Stallings, Corley, Krauter, & Hewitt, 2000). Individuals higher on sensation seeking and impulsivity are also more likely to appraise the risks associated with certain activities as being less severe than do individuals lower on these traits (Horvath & Zuckerman, 1993; Robbins & Bryan, 2004; Rosenbloom, 2003). Further, there is evidence for an inverse relationship between risk appraisal and substance use. That is, lower perceived risks of an activity, such as substance use, are associated with higher engagement in that activity (Benthin, Slovic, & Severson, 1993; Viscusi, 1992). This suggests that risk appraisals may be reduced as individuals become more familiar with an activity (Brown, 2005; Goldberg, Haipern-Felsher, & Millstein, 2002). For instance, people may have a high appraisal of the risks associated with alcohol use before they start drinking, and as they use more alcohol with few negative consequences, they begin to appraise the risks associated with alcohol use as less (Goldberg et al.). However, little research has examined the relationship between risk appraisal and engagement in an activity, while also taking into consideration relevant personality traits, such as sensation seeking and impulsivity. It is possible that people higher on these traits are more likely than others to appraise the risks of a certain activity as less regardless of their experience level with the activity. There is also little evidence for the role of perceived benefits of substance use and their relationship to personality traits (Horvath & Zuckerman; Smith & Anderson, 2001). For individuals higher on sensation
seeking, substance use may be evaluated as risky, but if the benefits outweigh the risks, they may put more emphasis on the advantages, and engage in use regardless of the risks.

The present study examines the influence of sensation seeking on the relationship between risk appraisal and alcohol use, while controlling for the influence of a related disinhibited personality trait, impulsivity, in undergraduate student drinkers. Studies showing a relationship between alcohol use and risk appraisal have not specified whether this relationship is similar across all levels of personality traits, such as sensation seeking (e.g., Agostinelli & Miller, 1994; Benthin et al., 1993; Goldberg et al., 2002; Hampson, Severson, Burns, Slovic, & Fisher, 2001). If the relationship between risk appraisal and substance use is solely determined by familiarity with the substance, then we would not expect to find an interaction between sensation seeking and alcohol use. However, if the level of sensation seeking also influences risk appraisal, then we would expect to find a stronger relationship between alcohol use and risk appraisal for individuals lower on sensation seeking than for those higher on the trait. Similarly, the relationship between the perception of benefits associated with alcohol use and alcohol use history may also depend on the level of sensation seeking. Individuals higher on sensation seeking may appraise the benefits associated with alcohol use as higher regardless of their actual experience with alcohol. Likewise, individuals lower on sensation seeking, may show a stronger relationship between perceived benefits of alcohol use and alcohol use history. These clarifications would enhance current knowledge about the interrelationships of these important psychological contributors to heavy substance use.

1.1 Risk Appraisal

Risk perceptions are personal judgments or appraisals about the potential negative consequences associated with an activity (Slovic, 1987). These perceptions have been related to risk-taking behaviour. Individuals who engaged in more risk-taking behaviour, such as using
alcohol (Agostinelli & Miller, 1994; Benthin et al., 1993; Cook & Bellis, 2001), drugs (Benthin et al.; Cook & Bellis), and smoking cigarettes (Benthin et al.; Cook & Bellis; Viscusi, 1992), perceived the risks of those activities to be lower than individuals who were less likely to engage in risk-taking behaviours. In addition, longitudinal research has shown that the level of risk-taking behaviours early in life predicts risk-taking behaviours in adulthood (DuRant, Smith, Kreiter, & Krowchuk, 1999; Guy, Smith, & Bentler, 1994; Neumark & Anthony, 1997). Individuals who participated in risk-taking behaviours also perceived the benefits of participation as greater than the risks (Benthin et al.; Hampson et al., 2000).

Studies have shown a tendency for some individuals to misestimate the risks associated with certain activities. A sample of undergraduate students underestimated the annual fatality rates due to smoking and alcohol use, while overestimating the annual fatality rates of other activities such as fire fighting, police work, skiing, and mountain climbing (Slovic, Fischhoff, & Lichtenstein, 2000b). Slovic et al. (2000b) speculated that this misestimation may be related to individual experience with these activities. That is, undergraduates may underestimate the risks associated with activities with which they are more familiar. Adolescents who participated in an activity, such as drinking alcoholic beverages, binge drinking, smoking cigarettes, and smoking marijuana, compared to non-participants, perceived lower risks associated with the activity for themselves and for others, and also perceived the benefits of that activity as significantly greater than the risks (Benthin et al., 1993). There is evidence from longitudinal research that as adolescents’ experience with alcohol increases, they perceive fewer risks, and more benefits, associated with drinking (Goldberg et al., 2002), suggesting that familiarity with a substance reduces the perception of risks compared to benefits. Although the current study is cross-sectional, a negative relationship between alcohol use levels and risk perceptions would be consistent with the hypothesis that as individuals gain more exposure to a substance or activity
they tend to lower their perceptions of the risks compared to the benefits associated with that activity. It is also possible that this lower risk perception is due, in part, to certain personality traits, such as sensation seeking.

Some data suggest that risk appraisal for a variety of activities may reflect individual differences related more to personality traits like sensation seeking and impulsivity (Horvath & Zuckerman, 1993; Zuckerman, 2007a) and less to one's experience or familiarity with an activity. For instance, appraisals of different types of risky consequences (e.g., physical, mental, and punishment), have been found to be highly interrelated within individuals (Zuckerman, 1979b; also see Bell, Schoenrock, & O'Neal, 2000; Brown, 2005; Horvath & Zuckerman).

People also differ in how they perceive the risks associated with activities in general. That is, some individuals consistently rate risks higher than others, and this difference may be related to personality traits. A general tendency to associate fewer risks with some activities, such as substance use, may lead to increased participation in these activities. An alternative explanation may combine both hypotheses, where risk appraisals may be influenced by both familiarity and personality traits, such as sensation seeking and impulsivity. Specifically, personality traits may influence initial appraisals of risks, where people higher on certain personality traits, such as sensation seeking and impulsivity, tend to rate activities as less risky regardless of their experience.

Benefit appraisal may also form prior to alcohol use. Adolescents who, prior to beginning drinking, anticipated higher benefits from alcohol use, such as the belief that alcohol use would enhance their social lives, drank earlier and were more likely to develop alcohol use problems compared to those expecting fewer benefits (Christiansen, Smith, Roehling, & Goldman, 1989; Smith, McCarthy, & Goldman, 1995). This suggests that examining the appraisals of benefits would be as important as examining perceived risks. In addition, it is useful for studies to include
ratings of perceived risks and benefits to self and others in order to account for the optimistic bias, wherein people tend to underestimate their personal risk even if they can accurately predict the risks to others (Weinstein, 1989). Including ratings of risk to others would allow us to examine whether participants estimate the risks to others differently than risks to themselves, and whether this relationship varies as a function of their familiarity with the activity or level of sensation seeking.

1.2 Substance Use and Disinhibited Personality

"Sensation seeking is a trait defined by the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience" (Zuckerman, 1994, p.27). Impulsivity can be considered “a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to [the individual] or others” (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001, p.1784). Disinhibited personality traits, such as sensation seeking and impulsivity, have been associated with higher levels of substance use and substance-related problems. For example, higher levels of impulsivity (Dom, D'haene, Hulstijn, & Sabbe, 2006; Dom, Hulstijn, & Sabbe, 2006) and sensation seeking (Cloninger, Sigvardsson, & Bohman, 1988; Dom, Hulstijn et al.; Zuckerman, 1979a) have been associated with an earlier age of onset of alcohol abuse. There is a well established relationship between sensation seeking and a variety of risky behaviours, including alcohol use (Andrucci, Archer, Pancoast, & Gordon, 1989; Dom, Hulstijn et al.; Donohew et al., 2000; La Grange, Jones, Erb, & Reyes, 1995; Teichman, Barnea, & Ravav, 1989; Zuckerman, 1994), marijuana use (Andrucci et al.; Arnett, 1994; Donohew et al., 2000; Teichman et al.), other drug use (Andrucci et al.; Arnett), and cigarette smoking (Andrucci et al., 1989; Arnett; Frankenberger, 2004; Teichman et al.; Zuckerman, 1979b; Zuckerman, Ball, & Black, 1990). Longitudinal studies (Cloninger et al.;
Pedersen, 1991; Teichman et al.; Zuckerman, 1994) have found higher levels of sensation seeking predict higher amounts of future substance use, suggesting that sensation seeking contributes to substance use.

There is also a well established positive relationship between impulsivity and substance use (e.g., Dawe & Loxton, 2004; Jones, 1968; Petry, 2001; Robbins & Bryan, 2004; Sher & Trull, 1994; Slutske et. al., 2002; Tarter et al., 2003), including alcohol (Dom, Hulstijn, et al., 2006; Granö, Virtanen, Vahtera, Elova prinio, & Kivimäki, 2004; Jones 1968; Jones, 1971; Robbins & Bryan; Soloff, Lynch, & Moss, 2000), nicotine (Granö et al.; Robbins & Bryan), marijuana (Vangsness, Bry, & LaBouvie, 2005), and cocaine (Moeller, Dougherty et al., 2001). Specifically, higher levels of impulsivity have been associated with higher levels of alcohol use and dependence (Jones, 1968; Jones, 1971; Lynam, Leukefeld, & Clayton, 2003; Moeller, Dougherty et al.; Moffitt, 1993; Patock-Peckham & Morgan-Lopez, 2006; Tarter et al.). Therefore, individuals higher in the personality traits sensation seeking and impulsivity may be at a higher risk for alcohol use problems than individuals lower on these traits.

1.3 Risk Appraisal and Disinhibited Personality

It has been established that risk appraisal is inversely related to the personality traits sensation seeking (Bell et al., 2000; Horvath & Zuckerman, 1993; Rosenbloom, 2003; Zuckerman, 1979b) and impulsivity (Robbins & Bryan, 2004), where individuals higher on these personality traits tend to estimate the risks associated with some activities as less than individuals who are lower on these traits. Individuals higher on sensation seeking generally rate the risks associated with activities or situations as less than individuals lower on sensation seeking, even for activities with which they do not have direct experience (Zuckerman, 1979b; Zuckerman, 2007a). This may indicate that, at least initially, risk appraisal is related to personality features, rather than being solely a consequence of familiarity with an activity.
Higher sensation seekers have also been found to perceive the risks as equally low for themselves and others (Horvath & Zuckerman), contrary to the optimistic bias. In addition, although mean levels of risk tend to be lower across the board, individuals higher on sensation seeking are able to distinguish relatively high and low risk activities from each other as well as lower sensation seekers do (Rosenbloom). These findings demonstrate that although there is variability in their perceptions of risk, higher sensation seekers have a tendency to perceive fewer risks associated with an activity than do lower sensation seekers.

In a sample of students, where level of sensation seeking was not examined (Zuckerman, 1979b), it was demonstrated that the more experience an individual had with an activity, the lower they perceived the risks associated with that activity. However, lack of experience with an activity was not necessarily associated with higher perceived risks. No situation that individuals had experienced more than four times was rated as high risk, but novel situations were not necessarily considered high risk. A follow up study (Zuckerman, 1979b) indicated that higher sensation seekers, compared to lower sensation seekers, perceived the risks of activities as lower, even if they have no direct experience in that situation. This previous study only examined novel situations, not activities with which participants varied largely on their level of experience. It is reasonable, although not previously established, that higher sensation seekers may show less of a relationship between their past experience with an activity and their appraisal of the risks associated with that activity. Therefore, while higher sensation seekers may appraise the risks of situations as lower, it is also possible that their level of appraised risk for an activity does not vary as much with familiarity as for lower sensation seekers whose risk appraisals are more highly related to their past experience.

The perceived risks associated with an activity may also be a factor of the related benefits. For adolescents, sensation seeking was related to perceived greater benefits of an
activity, in addition to lower appraised risks, and individuals were more likely to participate in an activity if they perceived the benefits to be greater than the risks (Hampson et al., 2001). Additionally, Horvath and Zuckerman (1993) suggest that there is an initial risk appraisal of an activity before there is any direct experience with that activity, which may be less in higher sensation seekers, making them more likely to initiate participation in risky activities than people lower on sensation seeking. After experience with that activity, level of sensation seeking may determine how a person perceives future risks associated with that activity. Higher sensation seekers may maintain relatively constant lower appraisals of risks, while lower sensation seekers may perceive the risks as less only after increased exposure to the activity.

Sensation seeking is a multifactorial trait. Zuckerman's (1994) widely used Sensation Seeking Scale V (SSS-V) has four subscales: Thrill and Adventure Seeking (TAS), which measures a desire to engage in physically risky activities (e.g., skiing or skydiving); Experience Seeking (ES), which measures a desire for novel sensations and experiences; Disinhibition (Dis), which measures social disinhibition (e.g., alcohol consumption and sex); and Boredom Susceptibility (BS), which measures an intolerance for repetitive and routine experiences (e.g., restlessness). These facets have been differentially related to alcohol use (Hittner & Swickert, 2006; Zuckerman 1994), risk appraisal (Zuckerman, 1979b), and risk taking behaviour (Zuckerman 1994; Zuckerman 2007a). Hittner and Swickert's (2006) meta-analysis showed that Dis was the SSS-V subscale most strongly correlated with alcohol use, followed by ES, BS, and TAS, which was least strongly related. In a study examining the differential relationships of the SSS-V subscales to risk appraisal of various novel situations (i.e., those with which participants had a low level of experience), Zuckerman (1979b) found that TAS had the strongest negative relationships with appraisal of risk of physical harm or injury as well as mental harm (e.g., embarrassment, guilt, humiliation, or shame) in males and females. TAS was also most strongly
negatively related to risk appraisal of punishment or loss of something valuable in females, but ES was higher in males. ES had the next highest inverse correlations for physical harm or injury in males and females and mental risk in females, with D higher in males. BS was not significantly related to risk appraisal of any area in males, but was related in females. Mean level of each subscale was examined in groups of athletes (e.g., climbers, parachutists, white water, canoeists, martial artists, and hockey players) and TAS was highest in all groups, generally followed by ES (Breivik, 1991 as cited in Zuckerman, 1979b, 2007a). Since these scales are conceptually different and statistically dissociable, it is important to consider how these different aspects of sensation seeking are differentially related to alcohol use and risk appraisal.

Because sensation seeking and impulsivity are positively correlated (Blackburn, 1969; Zuckerman, 1979b), it is important to distinguish between the two and to control for the influence of impulsivity while looking at the relationship of sensation seeking to substance use and risk appraisal. There is support for impulsivity and sensation seeking as separate constructs which are differentially related to risk-taking behaviour and substance use (Fischer & Smith, 2004; Magid, MacLean, & Colder, 2007; Smith et al., 2007). Impulsivity pertains to the failure to control processes (Moeller, Barratt et al., 2001), while sensation seeking concerns the motivational systems associated with behaviour (Zuckerman, 1994). Higher sensation seekers' behaviour does not necessarily reflect carelessness, lack of planning, or disregard for consequences, as does that of those higher on impulsivity. For instance, higher sensation seekers may plan ahead (e.g., a ride home) or try to minimize the negative consequences associated with alcohol use (e.g., not drinking before an exam), resulting in less alcohol-related problems than those higher on impulsivity (Magid et al.). Higher sensation seekers, while likely to engage in risky behaviour, are less likely than individuals higher on impulsivity to engage in problem levels of the behaviour (i.e., alcohol-related problems; Smith et al., 2007). This study will
include impulsivity in analyses as a control variable in order to be confident that the moderator between alcohol use and risk appraisal is sensation seeking and not impulsivity.

1.4 Substance Use, Risk Appraisal, and Personality

Few studies have examined the relationship between risk appraisal and substance use while also considering related personality traits. Hampson et al. (2001) used structural equation modeling techniques to examine the relationship between perceived benefits versus risks, personality, and alcohol use in adolescents. They found that sensation seeking affected participation in alcohol-related risk taking (e.g., quantity and frequency of alcohol use) indirectly through an influence on the perceived benefits versus risks. The association between personality variables, such as sensation seeking, and alcohol-related risk-taking was entirely mediated by perceived benefits versus risks. However, structural equation modeling done by Horvath and Zuckerman (1993) suggested that risk appraisal did not mediate the relationship between sensation seeking and risky behaviour and instead was a consequence of the behaviour. In addition, Hampson et al. did not discuss whether the relationship held for all levels of sensation seeking. That is, perhaps the relationships identified by Hampson et al. pertained more strongly to individuals higher on sensation seeking rather than lower. It is, therefore, possible that the relationship between alcohol use and perceived benefits versus risks could be explained using a moderational model whereby the relationship between alcohol use and perceived benefits versus risks varies by level of sensation seeking. The current study tests the moderating effect of sensation seeking on the relationship between alcohol use and net risk appraisal.

1.5 Present Study

Based on past research, individuals higher on sensation seeking are more likely to engage in risky behaviour, such as alcohol use, and are more likely to appraise the risks associated with activities as lower, and the benefits as higher, than individuals lower on this trait, regardless of
their level of direct experience with these activities. Individuals higher on sensation seeking appear to underestimate the risks associated with certain activities, while overestimating the benefits, increasing their likelihood of initial and continued engagement in those activities. In addition, alcohol users have been shown to appraise the risks associated with alcohol use and other activities lower than non-users. It is, however, currently unclear how the relationship between alcohol use and risk appraisal is related to personality traits, of which the most relevant may be sensation seeking. It is also unclear how the perception of benefits, compared to risks, differs in relation to the amount of experience an individual has with alcohol.

The current study examines the hypothesis that the relationship between alcohol use and risk appraisal is moderated by sensation seeking. That is, that there will be an inverse relationship between level of alcohol use (i.e., familiarity with alcohol) and the perceived risks associated with that substance, and that this relationship will be moderated by the displayed level of sensation seeking traits. Specifically, we anticipate that lower sensation seekers, controlling for the influence of impulsivity, will show a stronger relationship between past alcohol use and perceived risks compared to benefits. That is, lower sensation seekers with little past experience with alcohol will perceive the net risks of alcohol use as higher. However, lower sensation seekers with greater levels of past alcohol use, will perceive less risks compared to benefits associated with drinking. It is also anticipated that individuals higher on sensation seeking will perceive the risks associated with alcohol use as lower, compared to the benefits, regardless of their past history of alcohol use. Those lower on sensation seeking, are expected to show a relationship between alcohol use and risk appraisal which is more dependent on their level of past use. This study includes ratings of perceived risks and benefits to self and others in order to account for the optimistic bias (Weinstein, 1989).
As sensation seeking is a multi-faceted trait (Zuckerman, 1994), each facet will be examined separately. There is not a lot of a priori theoretical work to make a strong hypothesis about one sensation seeking scale over others as a moderator, but conceptually, it was hypothesized that of the four scales, the relationship between familiarity with alcohol and net risk appraisal of alcohol would be most dependent on Experience Seeking since it relates to actively seeking out novel experiences. Thus, individuals higher on Experience Seeking would likely view activities as more beneficial and less risky before they have had experience with them, especially for activities associated with potential novel sensations, such as alcohol use. For those lower on Experience Seeking, as experience with alcohol increases, they may be more likely to lower their net risk appraisal in line with past research relating to familiarity (Agostinelli & Miller, 1994; Benthin et al., 1993; Cook & Bellis, 2001). In the current study, focusing on alcohol use levels, we would expect to find that higher sensation seekers, specifically those higher on Experience Seeking, would appraise the risks of alcohol use as lower, regardless of their past alcohol consumption. Furthermore, lower sensation seekers with greater levels of past alcohol consumption would perceive less risk compared to benefits than lower sensation seekers with smaller levels of past alcohol consumption.
2 Method

2.1 Participants

Three hundred and eighty-nine undergraduate student drinkers participated in this online questionnaire study. Participants (55% female) aged 19 to 44 (M=21.26; SD=2.83) had consumed at least one alcoholic beverage in the past 12 months. They were comparable in age to the participants in much previous research examining the interrelationships between personality, substance use, and risk appraisal (e.g., Donohew et al., 1999; Earleywine & Finn, 1991; Fischer & Smith, 2004; Franken, Gibson, & Rowland, 1992; Gray & Wilson, 2007; Henderson, Goldman, Coover, & Carnevalla, 1994; Jessor & Jessor, 1977; Kilme, Hunt, Lee, & Neighbors, 2007; La Grange et al., 1995; Schwarz, Burkhart, & Green, 1978). Fifty-eight percent described themselves as East Asian or of East Asian decent, while another 30% described themselves as European or of European decent. Other ethnicities represented included: First Nations, Indian-South Asian, Latin American-Hispanic, Middle Eastern, or a combination of more than one. Participants were recruited using the University of British Columbia Psychology Department’s human subject pool system, and participants received course credit for their participation in the study. Participants provided informed consent and all procedures were approved by the appropriate institutional ethics review board.

2.2 Personality Measures

2.2.1 Sensation seeking measure (see Appendix A for complete measure). The SSS-V (Zuckerman, 1994) is a well-established measure of the personality trait sensation seeking. This self-report questionnaire consists of 40 items in a forced choice format, which is used to control for the influence of social desirability by forcing respondents to choose one of two extremes equal in social desirability (Zuckerman, 1994, 2007b). The measure yields four 10-item subscale scores: Thrill and Adventure Seeking (TAS), Experience Seeking (ES), Disinhibition (Dis), and
Boredom Susceptibility (BS), as well as a total score (Zuckerman, 1994). The ES and Dis subscales include items related to substance use and behaviours. This study followed others by removing substance related questions from these scales to adjust for possible criterion contamination (see Hittner & Swickert, 2006). Correlations between subscales ranged from .15 to .42, suggesting that the subscales tap different aspects of sensation seeking but that there is a higher order construct common to all scales (Zuckerman, 1994). The discriminant validity of the subscales has been shown by findings relating them differentially to various measures, such as art or music preferences and biological factors such as evoked cortical potentials (Zuckerman, 2007b). This measure has commonly been used in undergraduate samples to relate sensation seeking to substance use (e.g., Donohew et al., 1999; Earleywine & Finn, 1991; Franken et al., 1992; Gray & Wilson, 2007; Henderson et al., 1994; La Grange et al., 1995; Schwarz et al., 1978) and risk appraisal (Horvath & Zuckerman, 1993; Zuckerman et al., 1990).

Internal consistency of the total score ranged from .83 to .86 and the reliabilities of the subscales were: TAS, .77 - .82; ES, .61 - .67; Dis, .74 - .78; and BS, .56 - .65 (Zuckerman, 1994). In a longitudinal study of undergraduates using the SSS-V, Pedersen (1991) found that sensation seeking was stable across a 20 month period, with test-retest reliabilities for the subscales ranging from .59 (for ES) to .79 (for TAS); the study excluded the BS subscale. Subscale scores at time one were also predictive of substance use at time two with the Dis subscale being the strongest predictor.

2.2.2 Impulsivity measure (see Appendix B for complete measure). The BIS-11 (Patton, Stanford, & Barratt, 1995) is a 30-item self-report questionnaire, commonly used with undergraduate-aged samples (e.g., Hair & Hampson, 2006; Patton et al., 1995; Soloff et al., 2000; Stoltenberg, Batien, & Birgenheir, 2008) as a measure of the personality trait impulsivity. Participants answer items such as “I plan tasks carefully” using a four-point scale (rarely/never,
occasionally, often, almost always/always). The BIS-11 has been shown to be a useful measure for detecting variations in impulsive behavioural correlates, such as substance abuse (Soloff et al., 2000), alcohol consumption levels (Hair & Hampson), an earlier age of onset of alcohol problems (Dom, Hulstijn et al., 2006), and poor academic performance (Hair & Hampson).

The total score of the BIS-11 has been shown to have acceptable internal consistency for undergraduate students (Cronbach's alpha = .82), substance-abuse patients (Cronbach's alpha = .79), general psychiatric patients (Cronbach's alpha = .83), and prison inmates (Cronbach's alpha = .80; Patton et al., 1995).

2.3 Substance Use Measures

2.3.1 Alcohol use measure (see Appendix C for complete measure). The alcohol use questionnaire in this study employed questions recommended by the National Institute on Alcohol Abuse and Alcoholism's Task Force on Recommended Alcohol Questions (National Institute of Health, 2003). Self-report questions were used to determine the average frequency and quantity of alcohol consumption. A drink was defined as the equivalent of a glass of wine, a bottle or can of beer, a shot of liquor or a mixed drink. The average number of occasions per week or month when the participant consumed alcohol was used to determine a yearly average number of occasions on which the participant consumed alcohol. This number was then multiplied by the average number of drinks by the participant per occasion in the past 12 months, in order to get a total consumption value (e.g., Conrad, Petersen, & Pihl, 1997; Finn, Bobava, Wehner, Fargo, & Rickert, 2005; Finn & Hall, 2004). Previous studies have used a measure of quantity x frequency to determine alcohol consumption levels in undergraduate samples (e.g., Henderson et al., 1994; Schwarz et al., 1978). In addition, a longitudinal twin study found that the heritability of mean alcohol consumption was 70% and that test-retest reliability for a similar
quantity x frequency measure ranged from .56 over a 13 year interval to .69 over a four year retest interval (Whitfield, et al., 2004).

2.3.2 Drug use measure (see Appendix D for complete measure). The drug use measure used was a section of the Adolescent Drug Involvement Scale (ADIS; Moberg & Hahn, 1991) which is a comprehensive framework promoting a thorough declaration of all substances used by research participants and which has been developed for use with young adults, such as our undergraduate population. The ADIS has been shown to have acceptable internal consistency (Cronbach’s alpha = .85) and concurrent validity as indicated by high correlations with self-reports of drug use (e.g., r = .72) and perceptions of drug problems, (r = .79), as well as clinical assessments (r = .75; Moberg & Hahn). The section used in this study asked participants to rate their frequency of use of several illicit drugs (e.g., cannabis, amphetamines, cocaine, heroin, and valium) on an 8-point scale ranging from “never used” to “several times a day”. The question regarding cannabis was used in this study to examine whether the relationship between cannabis use and perceived risk of cannabis use as moderated by sensation seeking parallels that of alcohol use and risk appraisal for alcohol use.

2.4 Risk Appraisal Measures (see Appendix E for complete measures)

Risk appraisal measures were developed based on measures of risk and benefit perceptions used in previous studies (e.g., Benthin et al., 1993; Fischhoff, Slovic, Lichtenstein, Read, & Combs, 2000; Slovic, 2000; Slovic, Fischhoff, Lichtenstein, 2000a; Slovic et al., 2000b). There were five risk appraisal measures: 1) mortality risk appraisal; 2) perceived risk to self; 3) perceived benefits for self; 4) perceived risk to peers; and 5) perceived benefits for peers. In addition, there was a measure for frequency of engagement in the activities previously ranked for risk and benefit, which was used to determine the participant’s familiarity with certain activities.
The mortality risk appraisal measure consisted of 25 activities with varying levels of perceived risk based on previous studies (e.g., Benthin et al., 1993; Fischhoff et al., 2000; Slovic, 2000; Slovic et al., 2000a; Slovic et al., 2000b), ranging from high-risk (e.g., using handguns, shooting heroin, or smoking cigarettes) to socially acceptable or low-risk activities (e.g., riding a bicycle, receiving vaccinations, or skiing/snowboarding). Instructions informed participants of the approximate number of deaths per year in Canada (225,000; Statistics Canada, 2004), and asked them to indicate how many of those deaths they believed to be due to each activity. It was also noted that the total for the listed activities did not need to add to 225,000.

The perceived risk to self measure asked participants to rank 20 activities according to how risky they perceived the activities to be, where 1 was the most risky and 20 was the least risky. For the purposes of this measure, risk was defined as the likelihood of a negative outcome occurring (e.g., “death, physical pain, emotional pain, negative social judgement, reduced health, etc.”) if the participant were to engage in each activity. Forced ranking was used to avoid uniformity in ratings among activities (e.g., Slovic, 2000; Slovic et al., 2000b). Some items were different than the mortality risk appraisal items to allow for a broader range of risk, specifically adding more low-risk items that were not as applicable in the mortality estimates (e.g., cooking and drinking coffee), that is, they are unlikely to cause death. Activities examined in this study include perceived risk for alcohol and cannabis use.

The perceived benefit for self measure asks participants to rank the same 20 activities according to how beneficial they perceive the activities to be, where 1 is the most beneficial and 20 is the least beneficial. Benefit was defined as the likelihood of a positive outcome occurring (e.g., “increased life-span, physical pleasure, emotional pleasure, positive social judgment, improved health, etc.”) if the participant were to engage in each activity. Activities were the
same as the perceived risk measure and this study also examined perceived benefits for alcohol and cannabis use.

In order to account for the optimistic bias, wherein people tend to underestimate their personal risk even if they can accurately predict the risks to others (Weinstein, 1989), this study includes ratings of perceived risk and benefit to peers as well as self. Peers are defined for participants as: “people close to your age including people you don’t know” so that participants consider the risks to people in general, not solely for people within their social circle. Participants were asked to rank the same 20 items as previously discussed according to their perceived risk and benefit for peers. Again, alcohol and cannabis use were examined in this study.

There is very little reliability information available for similar measures of risk or benefit perception, however, Slovic et al. (2000a) found risks and benefits associated with activities to be inversely related ($r = -0.42$). For analyses in the current study, a measure of the net risk appraisal was calculated by subtracting perceived benefits from perceived risks for each activity (e.g., Slovic, 2000b). This was done in order to account for the influence of both perceived risks and benefits. Higher values indicate a greater difference between perceived risks and benefits and positive values indicate that risks were perceived lower than benefits for that activity.

Participants were also asked to rate their frequency of engagement in each of the activities, using an 8-point scale (never, daily, several times a week, several times a month, several times in the past year, once or twice in the past year, in the past: frequently but not in the past year, and in the past: but not frequently).

2.5 Procedure

Participants completed questionnaires using an online survey administration method on the website www.SurveyMonkey.com, and then attended a debriefing session in person.
Internet-based administration was used because of the advantages it holds over paper-based administration: it prevents data entry errors, it forces participants to fully complete each question before being permitted to continue to the next questionnaire and it reduces the requirements for paper and researcher time. All students at this university have access to a computer either at home or through the institution and therefore, this administration method is unlikely to exclude any possible participants. Previous studies have supported the use of internet-based administration of questionnaires previously used in paper format (Buchanan & Smith, 1999b; Davis, 1999; Surís, Borman, Lind, & Kashner, 2007). Specifically, support has been found for the criterion validity of online versions of personality questionnaires (Buchanan & Smith, 1999a; Davis; Surís et al., 2007). When comparing paper- and internet-based administration of a personality questionnaire, internal consistency was similar (Cronbach’s alpha = .82-.88) indicating that a single construct was being consistently measured by the questionnaire using both administration methods (Davis). It was also found that there were no significant main effects for location of online completion (i.e., home computer, public computer, campus computer) and questionnaire responses (Davis). Further, studies have shown that participants prefer to use computer-based responding methods when sensitive subject matter is involved, such as substance use (Lucas, Mullin, Luna, & McInroy, 1977; Skinner & Allen, 1983), making internet-based administration a rational choice of this study.

Due to a lack of reliability information for these measures in a computer administered format, a concurrent study was conducted to ensure reliability of the measures in an online format. Participants were randomly assigned to one of three groups; paper only, online only, or cross-method. Paper only participants completed paper versions of the questionnaires at Time 1 and Time 2 (7-14 days apart). Online only participants completed online versions of the questionnaires at Time 1 and Time 2, and cross-method participants completed one paper and
one online version of the questionnaires counter-balanced for Time 1 and Time 2. Test-retest reliabilities for the online versions ranged from .50 – 1.00 (all p < .001). See Appendix F for reliability data.

2.6 Statistical Analyses

In the initial stages of analysis, distributional assumptions were evaluated to determine if variables were normally distributed or if they needed to be transformed. Key variables used in analyses included age, sex (0=female, 1=male), net risk appraisal of alcohol use to self, net risk appraisal of alcohol use to peers, risk appraisal of cannabis use to self, alcohol quantity x frequency for the past year, cannabis use pattern, BIS-11 total score, and the four SSS-V subscales. Because participants were undergraduate students and had to be of legal drinking age, there were a disproportionate number of 19 to 21 year olds, so age was dichotomized at the median. Past year alcohol consumption was positively skewed and a natural log transformation was used to produce a reasonably normal distribution. Cannabis use was also positively skewed because of the large number of participants (53%) who had never tried cannabis. The natural log transformation produced a less skewed variable. To reduce multicollinearity between predictors and their products (i.e., the interaction term), the Aiken and West (1991) recommended procedure for centering all predictors in a regression analysis involving an interaction was used.
3 Results

Table 1 shows the means and standard deviations for all variables. Mean net risk appraisal of alcohol use for self was -1.96; higher perceived risks compared to benefits, where 0 would be risk equal to benefits. Compared to alcohol, net risk appraisal for cannabis (M = -4.57) was perceived as being even more risky than beneficial. First order correlations between all variables are presented in Table 2. BIS-11 total score and all SSS-V subscales are significantly correlated with alcohol use, with the strongest correlation for Dis (r = .51, p ≤ .001). TAS and Dis are the only personality measures significantly correlated with net risk appraisal of alcohol for self (r = -.19, p ≤ .001; r = .13, p ≤ .05, respectively). Higher TAS relates to higher perceived risks compared to benefits, whereas higher Dis relates to lower perceived risks compared to benefits. Alcohol consumption is positively correlated with net risk appraisal of alcohol use to self (r = .15, p ≤ .01); higher alcohol consumption relates to lower perceived risks compared to benefits. The same pattern is evident for cannabis use (r = .57, p ≤ .001); greater past use of cannabis relates to lower perceived risks compared to benefits.

3.1 Net Risk Appraisal of Alcohol Use for Self

In the first step of a hierarchical regression analysis, the control variables of impulsivity (BIS-11 Total Score), sex, and age were entered. This step did not account for a significant proportion of variance in risk appraisal (F(3, 384) = 1.166, p = .323). In the next block, past alcohol consumption significantly predicted net risk appraisal (β = .155, p = .006) but ES did not (β = .021, p = .689). In the final step of the analysis, the interaction between ES and alcohol use was added. ES significantly interacted with alcohol consumption in the prediction of net risk appraisal of alcohol use (F(1, 381) = 4.833, p = .029; β = -.112, p = .029; see Table 3). This step accounted for 4.4% of the variance in net risk appraisal, the addition of the interaction accounted for 1.2% of the variance in net risk appraisal. Individuals lower on ES showed a stronger
relationship between past alcohol use and net risk appraisals of alcohol use than individuals higher on this trait. Figure 1 shows a graph of the simple slopes for the relationship between past alcohol use and net risk appraisal at mean, low (mean-1SD) and high (mean +1SD) levels of ES. There were significant relationships between past alcohol use and net risk appraisal at low and mean levels of ES (simple slope = .792, t = 3.594, p <.001; simple slope = .432, t = 2.378, p = .018, respectively) but not at high levels (simple slope = .072, t = 0.274, p = .784). To clarify this relationship, similar regression analyses were conducted using the outcome variables of perceived risks of alcohol use to self and perceived benefits of alcohol use to self separately. Interaction terms for ES and risk or benefit appraisal were included in the final step of the analyses, and the relationship between alcohol use and net risk appraisal as moderated by ES appears to be driven more by risk than benefit (F(1, 381) = 3.609, p = .058; β = -.097, p = .058; F(1, 381) = 1.962, p = .162; β = .070, p = .162, respectively). While TAS significantly predicted net risk appraisal (β = -.229, p < .001), the interaction between TAS and alcohol consumption was not significant (β = .087, p = .080; see Table 3). None of the other SSS-V subscales significantly interacted with past alcohol use to predict net risk appraisal (.058 ≤ β ≤ .046, .258 ≤ p ≤ .365). There were no significant main effects for Dis (β = .066, p = .271) or BS (β = .017, p = .769). Nor were there main effects for BIS-11 Total Score in any analysis (.044 ≤ β ≤ .057, .266 ≤ p ≤ .407).

3.2 Mortality Risk Ratings for Alcohol Use

Paralleling the analyses above, the mortality risk rating for alcohol use was predicted from age, sex, and impulsivity. This step did not account for a significant amount of the variance in mortality risk ratings (F(3, 384) = 1.159, p = .325). The next block containing ES and alcohol consumption did not significantly predict mortality risk rating (F(2, 382) = .980, p = .376) nor were there any significant main effects for ES or alcohol use (β = -.066, p = .219; β = -.016, p =
The final step containing the interaction between ES and alcohol consumption was marginally significant ($F(1, 381) = 3.059, p = .081$) and accounted for 2.2% of the variance in mortality risk ratings (see Table 4). There were no significant main effects for any SSS-V subscale ($-.064 \leq \beta \leq .037, .292 \leq p \leq .834$). Nor were there significant main effects for BIS-11 Total Score in any analysis ($-.023 \leq \beta \leq -.009, .683 \leq p \leq .872$). However, Dis (see Table 4 and Figure 2) did significantly interact with alcohol use in the prediction of mortality risk appraisal ($F(1, 381) = 8.213, \beta = .148$). The relationship between past alcohol consumption and mortality risk ratings for alcohol was significant at low (mean-1SD) and high (mean +1SD) levels of Dis (simple slope = -.095, $t = -2.310, p = .021$; simple slope = .125, $t = 2.374, p = .018$, respectively), but not for mean levels (simple slope = .015, $t = 0.335, p = .738$). The final Dis model accounted for 3.4% of the variance in mortality risk appraisal. TAS and BS did not significantly interact with alcohol use ($\beta = .059, p = .253; \beta = .049, p = .343$, respectively).

### 3.3 Net Risk Appraisal of Cannabis Use for Self

In parallel analyses using cannabis use and net risk appraisal of cannabis for self in place of the alcohol measures, a similar pattern was evident. Cannabis use significantly interacted with ES in the prediction of net risk appraisal for self of cannabis use ($F (1, 381) = 5.429, p = .020; \beta = -.099, p = .020$; see Table 5 and Figure 3a). The relationship between past cannabis use and net risk appraisal for cannabis use was significant at all levels of ES. However, the relationship was strongest at lower levels (simple slope = 12.674, $t = 8.722, p < 0.001$) and weakest at higher levels of ES (simple slope = 8.556, $t = 7.815, p < 0.001$) with mean levels in between (simple slope = 10.615, $t = 11.348, p < .001$). This model accounted for 37.0% of the variance in net risk appraisal for cannabis. Dis also significantly interacted with cannabis use in the prediction of cannabis risk appraisal ($F(1, 381) = 6.195, p = .013; \beta = -.106, p = .013$; see Table 5 and Figure 3b). The relationship between past cannabis use and net risk appraisal for cannabis use was also
significant at all levels of Dis. However, the relationship was strongest at lower levels (simple slope = 13.065, t = 8.667, p < .001) and weakest at higher levels of Dis (simple slope = 8.323, t = 7.339, p < .001) with mean levels in between (simple slope = 10.694, t = 11.439, p < .001). This model accounted for 37.1% of the variance in cannabis risk appraisal. There were also significant main effects for ES (β = .095, p = .030), Dis (β = .095, p = .041) and TAS predicting net risk appraisal of cannabis (β = -.112, p = .009) but not for BS (β = -.008, p = .865). Nor were there significant main effects for BIS-11 Total Score in any of the analyses predicting net risk appraisal for cannabis (-.029 ≤ β ≤ -.010, .498 ≤ p ≤ .811). There were no significant interactions with cannabis use for TAS (β = -.053, p = .213) or BS (β = -.079, p = .063).

3.4 Net Risk Appraisal of Alcohol Use for Peers.

In the first step of a hierarchical regression analysis predicting net risk of alcohol use for peers, impulsivity, sex, and age were entered. Analyses followed as above and this first step did not account for a significant proportion of variance in risk appraisal (F(3, 385) = .410, p = .664). The next block contained ES and alcohol consumption. ES significantly predicted net risk to peers, but alcohol consumption did not (β = .112, p = .038; β = -.007, p = .908, respectively). In the final step of the analysis, the interaction between ES and alcohol use was added. When looking at net risk to peers as the outcome variable, ES did not interact with alcohol consumption (F(1, 381) = .422, p = .516; β = -.033, p = .516), however, ES continued to predict net risk appraisal to peers (β = .114, p = .036). Parallel analyses were done with each SSS-V subscale. There was a significant main effect for Dis in the prediction of net risk to peers (β = .122, p = .045); higher levels of Dis were related to lower net risk appraisal. No other SSS-V subscale had a main effect predicting net risk to peers (-.067 ≤ β ≤ -.050, .209 ≤ p ≤ .655). Nor were there any significant main effects for BIS-11 Total Score (.039 ≤ β ≤ .060, .257 ≤ p ≤ .465).
No other SSS-V subscale interacted with alcohol use in the prediction of net risk appraisal of alcohol use for peers ($-0.076 \leq \beta \leq 0.075, 0.146 \leq p \leq 0.639$).
4 Discussion

As hypothesized, there was an inverse relationship between level of alcohol use and the perceived risks compared to benefits for self associated with alcohol use. The same pattern is seen between cannabis use and perceived risks compared to benefits for self of cannabis use. For both alcohol and cannabis, the relationship was moderated by ES, as predicted. In addition, the relationship between cannabis use and net risk appraisal of cannabis use was moderated by Dis. Dis also moderated the relationship between alcohol use and mortality risk ratings for alcohol use. Impulsivity was not a significant predictor of net risk appraisal when sensation seeking was included in analyses.

4.1 Experience Seeking

Experience Seeking was the only subscale of the SSS-V to significantly interact with past year alcohol consumption in the prediction of the net risk appraisal of alcohol use. Individuals lower on ES showed a stronger relationship between past alcohol use and net risk appraisals of alcohol use than individuals higher on this trait. That is, familiarity with alcohol appears to be less important in the prediction of risk for those higher on ES. This is what was expected as individuals higher on ES are likely to seek out new activities and experiences with which they are unfamiliar (Zuckerman, 1994). Therefore, it seems reasonable that they would be less likely to consider unfamiliar activities as risky. This is the only facet of sensation seeking that captures the seeking of experiences for the sake of having them. This interaction between alcohol use and ES predicting net risk appraisal appears to be driven more by perceived risks associated with alcohol use than benefits.

The significant interaction between ES and past use also extends to the use of cannabis. Those lower on ES showed a stronger relationship between past cannabis use and net risk appraisal of cannabis use. However, the relationship between cannabis use and net risk appraisal
was significant at all levels of ES, indicating that familiarity with the substance does seem to be very important in one’s appraisals of risk. Individuals higher on ES, though, show less of a relationship between past use and risk appraisal, suggesting that their appraisals are less dependent on past experience. The significant relationship at all levels of ES, compared to alcohol, may be associated to the availability and legality of alcohol over cannabis. It may be possible to have some familiarity with alcohol by being around others drinking, even if one has consumed little or no alcohol oneself. However, it seems less likely for someone to be around cannabis use if they are not a user themselves. It is reasonable, then, that it would be even more unlikely for somebody low on ES to be around cannabis use as a non-user; just by nature of the trait and being drawn to novel experiences.

Risk appraisal was also estimated using mortality risk ratings for alcohol use. For this outcome measure of risk, there was a marginally significant interaction between ES and alcohol use. Interestingly, although non-significant, the data showed that individuals higher on ES actually had higher levels of mortality risk ratings at higher levels of alcohol use. Individuals lower on ES had lower mortality risk appraisals at higher levels of use. Participants may have perceived the risk and benefit appraisals, making up net risk appraisal, as more short-term. Whereas mortality risk appraisal is likely to be considered a long-term negative outcome of drinking. ES is highly correlated with past alcohol use \((r = .31, p < .001)\), and heavy drinking has been correlated with alcohol related problems (e.g., Wechsler, Dowdall, Davenport, & Rimm, 1995). It is therefore possible, although not examined in this study, that those higher on ES have had a bad experience related to excessive alcohol use (e.g., alcohol poisoning) that may lead them to estimate fatalities (i.e., long-term risk) due to alcohol use as higher. They may continue to focus on the short-term benefits compared to risks when choosing to drink and when appraising the risks of short-term negative outcomes associated with alcohol use. Individuals
lower on ES, who are less likely to have consumed amounts of alcohol high enough to produce severe negative consequences, may lower their perceptions of short- and long-term risks as their experience with alcohol increases.

4.2 Thrill and Adventure Seeking

There was also a trend towards a significant interaction between TAS and alcohol use in the prediction of net risk appraisal. Although non-significant, it is interesting that the relationship for this interaction is in the opposite direction of ES. Individuals higher on TAS showed a stronger relationship between past alcohol use and net risk appraisal. When examining the first order correlations, TAS is the only SS subscale significantly related to the perceived risk for self of alcohol use. Higher levels of TAS correlate with greater perceived risk of alcohol.

In addition, while other SSS-V subscales are significantly positively related to perceived benefit for self of alcohol, TAS is the only subscale negatively correlated; higher levels of TAS correspond to less perceived benefits. TAS is also the only subscale significantly negatively related to net risk appraisal indicating that individuals higher on TAS perceived the risks of alcohol use as out weighing the benefits. Zuckerman (2007a) speculated that individuals higher on TAS are less likely to enjoy activities that may impair their health and ability to participate in physically demanding extreme sports. Using the frequency of engagement ratings provided by participants for all activities rated, post hoc analyses were conducted to examine the correlations between TAS and socially acceptable high risk activities. Consistent with the idea that individuals higher on TAS may value their health in order to participate in physically challenging activities, TAS was the subscale most highly correlated with frequency of engagement in activities such as playing high-school or college contact sports (e.g., hockey, football, etc.; \( r = .192, p < .001 \)), surfing \( (r = .273, p < .001) \), skiing/snowboarding \( (r = .325, p < .001) \), skydiving \( (r = .121, p = .017) \), and mountain climbing \( (r = .171, p < .001) \). While TAS is
positively correlated to past year alcohol consumption, it is the smallest correlation of all the SSS-V subscales \( r = .140, p = .006 \) compared to \( .175 < r < .304, p \leq .001 \) for all other scales), which is consistent with past findings (see Hittner & Swickert, 2006). It is also least strongly related to marijuana use \( r = .240, p < .001 \), although all subscales are significantly related \( .288 \leq r \leq .503, p < .001 \) for all other scales), as well as past use of LSD \( r = .169 \) compared to \( .172 \leq r \leq .375 \) for the other subscales), Amphetamines \( r = .067 \) compared to \( .135 \leq r \leq .174 \) for the other subscales), Cocaine \( r = .076 \) compared to \( .185 \leq r \leq .202 \) for the other subscales), Barbiturates \( r = .166 \) compared to \( .199 \leq r \leq .212 \) for the other subscales), Ecstasy \( r = .133 \) compared to \( .199 \leq r \leq .331 \) for the other subscales), and smoking cigarettes \( r = .081 \) compared to \( .143 \leq r \leq .184 \) for the other subscales).

4.3 Disinhibition.

The Dis subscale was the most highly correlated with alcohol consumption in this sample, consistent with previous research (Hittner & Swickert, 2006). Dis is also the subscale most strongly correlated with perceived benefits to self of alcohol use, where those higher on Dis expect greater benefits from drinking. It has been supposed that higher sensation seekers take more risks than individuals lower on that trait because they place greater value on the rewards or benefits associated with risky activities (Horvath & Zuckerman, 1993, Zuckerman, 2007a). Those higher on Dis may drink more because the benefits are more important to them than the risks, even if they are able to accurately appraise the risk associated with alcohol use. This reward seeking behaviour is in line with the acquired preparedness model (Smith & Anderson, 2001), which posits that certain disinhibited personality traits, make it more likely that individuals will learn to expect more benefits than negative consequences from alcohol. If this bias were maintained at all levels of alcohol consumption, it would make sense that Dis would not interact with use in the prediction of risk appraisal.
There was, however, a significant interaction between Dis and alcohol use in the prediction of mortality risk ratings. Like ES, the data showed that individuals higher on Dis had higher levels of mortality risk ratings at higher levels of alcohol use. Individuals lower on Dis had lower mortality risk appraisals at higher levels of use. As discussed above, the long-term risks (i.e., death) associated with alcohol use may be perceived more accurately by those higher on Dis if they have witnessed or experienced severe negative consequences of drinking (e.g., alcohol poisoning). This may be directly related to their level of alcohol consumption (Wechsler et al., 1995), which is greater at higher levels of Dis; it is the SSS-V subscale most highly correlated with past alcohol use ($r = .51, p < .001$ in this study and see Hittner & Swickert, 2006). Individuals higher on Dis may continue to focus more on the short-term benefits compared to risks when choosing to drink and when appraising short-term outcomes associated with alcohol use.

Dis also significantly interacted with cannabis use in the prediction of net risk appraisal of cannabis use for self. Higher levels of cannabis use corresponded to lower risks compared to benefits at all levels of Dis. However, the relationship was strongest at low levels of Dis. Individuals higher on Dis may initially appraise net risk of cannabis use as lower, and for all levels of Dis, greater experience with cannabis was related to lower perceived risks compared to benefits. The strength of the relationship between cannabis use and appraisal of risks may, again, be due to familiarity (i.e., availability and legality) with the substance, as with ES.

4.4 Boredom Susceptibility.

BS is also significantly positively correlated with perceived benefits to self of alcohol use and may likewise be explained by the acquired preparedness model (Smith & Anderson, 2001). There was no significant interaction for BS and alcohol use in the prediction of net risk appraisal or mortality risk appraisal. The interaction between BS and cannabis use was marginally
significant in predicting net risk appraisal of cannabis use to self. The BS subscale is related to a low tolerance for boredom and individuals higher on this facet tend to avoid activities that they may find tedious or uninteresting (Zuckerman, 1994), it is less descriptive of individuals who seek out certain types (i.e., interesting and exciting) of experiences. In this respect, individuals higher on this trait may be less inclined to evaluate the risks associated with an activity and instead may focus on the benefits to them (e.g., avoiding boredom), similar to those higher on Dis. If they are uninterested in the risks, then it is unlikely that their risk appraisals will be accurate or that they will change with increased exposure to the substance.

4.5 BIS-11 Total Score

There were no significant main effects for impulsivity in any analysis. However, BIS-11 Total Score was significantly correlated with both alcohol and cannabis use at the first-order level. BIS-11 Total Score was also significantly related to net risk appraisal for cannabis, but not to net risk appraisal for alcohol use, nor for risk or benefit appraisal separately. This is consistent with the idea that individuals higher on impulsivity act without considering the risks or benefits involved (Moeller, Barratt et al., 2001). As impulsivity was controlled for, this indicates that it is the unique aspects of sensation seeking, independent of impulsivity, which moderate the relationship between substance use and risk appraisal.

4.6 Risk to Peers

There were no significant interactions between any sensation seeking scale and past alcohol use predicting the net risk of alcohol use for peers. This finding is consistent with the Optimistic Bias (Weinstein, 1989), which states that people tend to underestimate the risk to themselves while still correctly predicting the risk to others. There was, however, a significant main effect for ES ($\beta = .112, p = .038$) and Dis ($\beta = .122, p = .045$) in predicting net risk appraisal of alcohol use to peers. Higher levels of ES or Dis were related to lower perceived net
risks of alcohol use to peers, consistent with past research showing a negative relationship between sensation seeking and appraisal of risks to others (Horvath & Zuckerman, 1993). This is also consistent with the hypothesis that individuals higher on ES have generally lower risk appraisals for activities, even if they have little or no direct experience with the activity. Unlike other aspects of sensation seeking, ES pertains to the inclination to seek out novel experiences (Zuckerman, 1994) and for this reason, it makes sense that they would view unfamiliar experiences more favourably. As Dis is the subscale most highly related to substance use (Hittner & Swickert, 2006), it also makes sense that individuals higher on Dis would view alcohol use as less risky compared to beneficial. It would be interesting to see if this relationship held for non-substance related activities. This could have implications for interventions regarding alcohol use and related problems. Interventions may be more successful if aimed at those lower on sensation seeking, especially ES and Dis, compared to those higher on the traits. It may also be possible to include ratings to others as a way to get individuals to more accurately predict the risks and benefits associated with higher risk behaviours, such as drinking.

4.7 Limitations and Future Directions

4.7.1 Cross-sectional and self-report methods. This study was limited by the cross-sectional and self-report methods of data collection, however, these are the most common methods of examining the relationship between personality traits, such as sensation seeking, and alcohol use (see Hittner & Swickert, 2006). It would be useful to replicate these findings using longitudinal measures of alcohol use and risk appraisal to examine changes in risk perception as a function of increased familiarity with alcohol for different levels of sensation seeking. The current study, however, provides important information about the moderating effects of personality traits on the relationship between familiarity with an activity and risk appraisal of that activity.
4.7.2 Online administration. Online administration offers many benefits over paper administration, as noted in the method section. However, this is a relatively new medium, and there is still a lot of work to be done collecting evidence for the reliability and validity of measures previously used in paper format only. As such, online administration, while highly beneficial, currently has less psychometric support than the traditional, paper administration method. This study, and the concurrent two-part supporting study, help contribute to this knowledge base and advance recognition of this new method of conducting research as others have done (Buchanan & Smith, 1999b; Davis, 1999; Suris et al., 2007).

4.7.3 Ethnicity and culture. While ethnicity and culture were not foci of this study, 58% of the sample described themselves as East Asian or of East Asian descent, which is representative of the undergraduate population at the university from which they were drawn. East Asian ancestry has been related to lower levels of alcohol use compared to European ancestry (e.g., Tu & Israel, 1995; Tucker, Orlando, & Ellickson, 2003). This can be at least partially explained by biological factors (e.g., Luczak, Wall, Shea, Byun, & Carr, 2001; Tu & Israel, 1995). However, level of acculturation has also been related to alcohol use (Hahm, Lahiff, & Guterman, 2004; Tu & Israel, 1995). Since the current study was not focused on cultural effects, the level of identification participants had with North American culture was not evaluated. Future research should include measures of acculturation in order to better evaluate differences between ethnicity groups.

4.8 Conclusions

Sensation seeking moderated the relationship between substance use and net risk appraisal of that substance. It is the combination of both familiarity (i.e., past experience) with a substance and level of sensation seeking that together predict risk appraisal. This is the first study to our knowledge to identify the moderating role of sensation seeking in the relationship
between substance use and risk appraisal of that substance. This study suggests that it is important to consider both level of familiarity as well as level of sensation seeking when examining risk appraisal tendencies.
Table 1. Means and Standard Deviations for all Variables.

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Note: Est Alc Yr = the natural log transformation of the quantity x frequency of drinks consumed in the past year, Cannabis = the natural log transformation of the pattern of cannabis use, BIS_Total = Barratt Impulsiveness Scale Total Score, SSSV = Sensation Seeking Scale-V, ES_NS = Experience Seeking with substance related questions removed, TAS = Thrill and Adventure Seeking, DIS_NS = Disinhibition with substance related questions removed, BS = Boredom Susceptibility. Total = total score, Alc Mort (Z-Score) = the Z transformation of the estimated number of deaths per year due to alcohol use, Net RA Alc S = net risk appraisal for alcohol use for self, Net RA Alc P = net risk appraisal for alcohol use for peers, Net RA Cannabis S = net risk appraisal for cannabis use for self, RS Alcohol = perceived risk to self for alcohol use, BS Alcohol = perceived benefits to self for alcohol use, RP Alcohol = perceived risk to peers for alcohol use, BP Alcohol = perceived benefits to peers for alcohol use.
Table 2. First Order Correlations (N=389).

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<th>SSSV-BS</th>
<th>SSSV-Total</th>
<th>Aic Mort (Z-Score)</th>
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<th>Net RA Alc P</th>
<th>Net RA Cannabis S</th>
<th>RS Alcohol</th>
<th>BS Alcohol</th>
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<td>.06</td>
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<td>-.03</td>
<td>-.02</td>
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<td>.34***</td>
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<tr>
<td>BS Alcohol</td>
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Note: Est Aic Yr = the natural log transformation of the quantity x frequency of drinks consumed in the past year, Cannabis = the natural log transformation of the pattern of cannabis use, BIS_Total = Barratt Impulsiveness Scale Total Score, SSSV = Sensation Seeking Scale V, ES_NS = Experience Seeking with
substance related questions removed, TAS = Thrill and Adventure Seeking, Dis_NS = Disinhibition with substance related questions removed, BS = Boredom Susceptibility. Total = total score, Alc Mort (Z-Score) = the Z transformation of the estimated number of deaths per year due to alcohol use, Net RA Alc S = net risk appraisal for alcohol use for self, Net RA Alc P = net risk appraisal for alcohol use for peers, Net RA Cannabis S = net risk appraisal for cannabis use for self, RS Alcohol = perceived risk to self for alcohol use, BS Alcohol = perceived benefits to self for alcohol use, RP Alcohol = perceived risk to peers for alcohol use, BP Alcohol = perceived benefits to peers for alcohol use. The correlation between ordinal variables RS Alcohol and BS Alcohol was Spearman, all others are Pearson correlations. Statistically significant results are presented in bold text.

~ p ≤ .10; * p ≤ .05; ** p ≤ .01; *** p ≤ .001.
Table 3. Hierarchical Regression Model Predicting Net Risk Appraisal of Alcohol Use for Self as moderated by the interaction of Sensation Seeking Scale-V subscales and Past Year Alcohol Consumption.

<table>
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<tr>
<th>Step in regression model</th>
<th>Sensation Seeking Scale V Subscale</th>
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<th>Thrill and Adventure Seeking</th>
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<td></td>
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<td>df</td>
<td>ΔR²</td>
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<tr>
<td>Step 1: Sex</td>
<td></td>
<td>3, 384</td>
<td>.009</td>
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<tr>
<td>Age</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>BIS-Total</td>
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<td>Scale</td>
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Note: BIS-Total = Barratt Impulsiveness Scale Total Score, SSSV = Sensation Seeking Scale-V, Alcohol Use = the natural log transformation of the mean quantity of alcohol consumed per occasion in past year X frequency of alcohol consumption in that time frame. Sex was dummy coded with 0 = female, 1 = male. All variables were centered per Aiken and West (1991). ΔR² is the change in variance accounted relative to the previous step in the regression. By definition ΔR² for Step 1 is just R² for the predictors at this step. FΔR² is the F ratio for the test of significance of the change in variance accounted for with each new step in the regression model. βs are standardized partial regression coefficients from the final step in the model. Bold entries indicate a significant effect.

* p ≤ .05; ***p ≤ .001
Table 4. Hierarchical Regression Model Predicting Mortality Risk Appraisal of Alcohol Use for Self as moderated by the interaction of Sensation Seeking Scale-V subscales and Past Year Alcohol Consumption.

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Note: BIS-Total = Barratt Impulsiveness Scale 11 Total Score, SSSV = Sensation Seeking Scale-V, A1c. Use = the natural log transformation of the mean quantity of alcohol consumed per occasion in past year X frequency of alcohol consumption in that time frame. Sex was dummy coded with 0 = female, 1 = male. All variables were centered per Aiken and West (1991). $\Delta R^2$ is the change in variance accounted relative to the previous step in the regression. By definition $\Delta R^2$ for Step 1 is just $R^2$ for the predictors at this step. $F_{\Delta R^2}$ is the $F$ ratio for the test of significance of the change in variance accounted for with each new step in the regression model. $\beta$s are standardized partial regression coefficients from the final step in the model. Bold entries indicate a significant effect.

$\sim p \leq .10$; ** $p \leq .01$
Table 5. Hierarchical Regression Model Predicting Net Risk Appraisal of Cannabis Use for Self as moderated by the interaction of Sensation Seeking Subscales and Past Cannabis Use.

<table>
<thead>
<tr>
<th>Step in regression model</th>
<th>Experience Seeking</th>
<th>Disinhibition</th>
</tr>
</thead>
<tbody>
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<td></td>
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</tr>
<tr>
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<td>Step 3: Cannabis Use x SSSV-Scale</td>
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<td>.009</td>
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Note: BIS-Total = Barratt Impulsiveness Scale 11 Total Score, SSSV = Sensation Seeking Scale-V, Cannabis Use = the natural log transformation of the pattern of cannabis use. Sex was dummy coded with 0 = female, 1 = male. All variables were centered per Aiken and West (1991). $\Delta R^2$ is the change in variance accounted relative to the previous step in the regression. By definition $\Delta R^2$ for Step 1 is just $R^2$ for the predictors at this step. $F_{AR^2}$ is the F ratio for the test of significance of the change in variance accounted for with each new step in the regression model. $\beta$s are standardized partial regression coefficients from the relevant step in the model. Bold entries indicate a significant effect.

* $p \leq .05$; ** $p \leq .001$.  


Figure 1. Experience Seeking Interacts with Alcohol Use in the Prediction of Net Risk Appraisal of Alcohol Use to Self.
Figure 2. Disinhibition Interacts with Alcohol Use in the Predict of Mortality Risk Rating of Alcohol Use.
Figure 3. Sensation Seeking Subscales Interact with Cannabis Use in the Prediction of Net Risk Appraisal of Cannabis Use to Self.

3.2 Experience Seeking

3.2 Disinhibition
References


Adolescents, alcohol, and substance abuse: Reaching teens through brief interventions (pp. 109-141). New York: Guilford Press.


Appendix A

SSS-V

Directions: Each of the items below contains two choices A and B. Please indicate which of the choices most describes your likes or the way you feel by circling either A or B. In some cases you may find items in which both choices describe your likes or feelings. Please choose the one which better describes your likes or feelings. In some cases you may find items in which you do not like either choice. In these cases mark the choice you dislike least. Do not leave any items blank. It is important you respond to all items with only one choice, A or B. We are interested only in your likes or feelings, not in how others feel about these things or how one is supposed to feel. There are no right or wrong answers as in other kinds of tests. Be frank and give your honest appraisal of yourself.

1. A. I like “wild” uninhibited parties. 
   B. I prefer quiet parties with good conversation.

2. A. There are some movies I enjoy seeing a second or even third time. 
   B. I can’t stand watching a movie that I’ve seen before.

3. A. I often wish I could be a mountain climber. 
   B. I can’t understand people who risk their necks climbing mountains.

4. A. I dislike all body odors. 
   B. I like some of the earthy body smells.

5. A. I get bored seeing the same old faces. 
   B. I like the comfortable familiarity of everyday friends.

6. A. I like to explore a strange city or section of town by myself, even if it means getting lost. 
   B. I prefer a guide when I am in a place I don’t know well.

7. A. I dislike people who do or say things just to upset others. 
   B. When you can predict almost everything a person will do and say he or she must be a bore.

8. A. I usually don’t enjoy a movie or play where I can predict what will happen in advance. 
   B. I don’t mind watching a movie or play where I can predict what will happen in advance.

9. A. I have tried marijuana or would like to. 
   B. I would never smoke marijuana.

10. A. I would not like to try any drug which might produce strange and dangerous effects on me. 
    B. I would like to try some of the drugs that produce hallucinations.
11. A. A sensible person avoids activities that are dangerous.
    B. I sometimes like to do things that are a little frightening.

12. A. I dislike “swingers” (people who are uninhibited and free about sex).
    B. I enjoy the company of real “swingers.”

13. A. I find that stimulants make me uncomfortable.
    B. I often like to get high (drinking liquor or smoking marijuana).

14. A. I like to try new foods that I have never tasted before.
    B. I order the dishes with which I am familiar so as to avoid disappointment.

15. A. I enjoy looking at home movies, videos, or travel slides.
    B. Looking at someone's home movies, videos, or travel slides bores me tremendously.

16. A. I would like to take up the sport of water skiing.
    B. I would not like to take up water skiing.

17. A. I would like to try surfboard riding.
    B. I would not like to try surfboard riding.

18. A. I would like to take off on a trip with no preplanned or definite routes, or timetable.
    B. When I go on a trip I plan my route and timetable fairly carefully.

19. A. I prefer the “down to earth” kinds of people as friends.
    B. I would like to make friends in some of the “far out” groups like artists or “punx.”

20. A. I would not like to learn to fly an airplane.
    B. I would like to learn to fly an airplane.

21. A. I prefer the surface of the water to the depths.
    B. I would like to go scuba diving.

22. A. I would like to meet some persons who are homosexual (men or women).
    B. I stay away from anyone I suspect of being “gay” or “lesbian.”

23. A. I would like to try parachute jumping.
    B. I would never want to try jumping out of a plane, with or without a parachute.

24. A. I prefer friends who are excitingly unpredictable.
    B. I prefer friends who are reliable and predictable.
25. A. I am not interested in experience for its own sake.  
   B. I like to have new and exciting experiences and sensations even if they're a little frightening, unconventional, or illegal.

26. A. The essence of good art is in its clarity, symmetry of form, and harmony of colours.  
   B. I often find beauty in the "clashing" colours and irregular forms of modern paintings.

27. A. I enjoy spending time in the familiar surroundings of home.  
   B. I get very restless if I have to stay around home for any length of time.

28. A. I like to dive off the high board.  
   B. I don't like the feeling I get standing on the high board.

29. A. I like to date persons who are physically exciting.  
   B. I like to date persons who share my values.

30. A. Heavy drinking usually ruins a party because some people get loud and boisterous.  
   B. Keeping the drinks full is the key to a good party.

31. A. The worst social sin is to be rude.  
   B. The worst social sin is to be a bore.

32. A. A person should have considerable sexual experience before marriage.  
   B. It is better if two married persons begin their sexual experience with each other.

33. A. Even if I had the money I would not care to associate with flighty rich persons in the "jet set."  
   B. I could conceive of myself seeking pleasures around the world with the "jet set."

34. A. I like people who are sharp and witty even if they do sometimes insult others.  
   B. I dislike people who have their fun at the expense of hurting the feelings of others.

35. A. There is altogether too much portrayal of sex in movies.  
   B. I enjoy watching many of the "sexy" scenes in movies.

36. A. I feel best after taking a couple of drinks.  
   B. Something is wrong with people who need liquor to feel good.

37. A. People should dress according to some standard of taste, neatness, and style.  
   B. People should dress in individual ways even if the effects are sometimes strange.
38. A. Sailing long distances in small crafts is foolhardy.
    B. I would like to sail a long distance in a small but seaworthy sailing craft.

39. A. I have no patience with dull or boring persons.
    B. I find something interesting in almost every person I talk to.

40. A. Skiing down a high mountain slope is a good way to end up on crutches.
    B. I think I would enjoy the sensations of skiing very fast down a high mountain slope.
Appendix B

**BIS-11**

Please tell us how often you do the following things using the 4-point scale:

1 = Rarely/Never   2 = Occasionally   3 = Often   4 = Almost Always/Always

Circle the number corresponding to your answer after each statement. Be as honest as you can and try to give an answer to every item, even if you have to guess. When you are done with this side of the page, turn it over and complete the items on the other side.

<table>
<thead>
<tr>
<th></th>
<th>Rarely/ Never</th>
<th>Occasion-ally</th>
<th>Often</th>
<th>Almost Always/ Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I plan tasks carefully.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. I do things without thinking.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. I make-up my mind quickly.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. I am happy-go-lucky.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. I don’t “pay attention.”</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. I have “racing” thoughts.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. I plan trips well ahead of time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. I am self-controlled.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. I concentrate easily.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. I save regularly.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. I “squirm” at plays or lectures.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. I am a careful thinker.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. I plan for job security.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. I say things without thinking.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. I like to think about complex problems.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td></td>
<td></td>
<td>Rarely/Never</td>
<td>Occasionally</td>
<td>Often</td>
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<td>--------------</td>
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</tr>
<tr>
<td>16.</td>
<td>I change jobs.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17.</td>
<td>I act “on impulse.”</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18.</td>
<td>I get easily bored when solving thought problems.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19.</td>
<td>I act on the spur of the moment.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20.</td>
<td>I am a steady thinker.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>21.</td>
<td>I change residences.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>22.</td>
<td>I buy things on impulse.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>23.</td>
<td>I can only think about one problem at a time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>24.</td>
<td>I change hobbies.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>25.</td>
<td>I spend or charge more than I earn.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>26.</td>
<td>I often have extraneous thoughts when thinking.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>27.</td>
<td>I am more interested in the present than the future.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>28.</td>
<td>I am restless at the theatre or lectures.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>29.</td>
<td>I like puzzles.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>30.</td>
<td>I am future oriented.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Appendix C

Alcohol Use Questionnaire

Please select the appropriate answer for each question regarding your alcohol use. Choose only one response for each question. If you are unsure, please provide your best guess. Be sure to provide an answer for every question.

For all questions, by a drink we mean half an ounce (30 ml) of absolute alcohol (e.g. a 12 ounce/355 ml can or glass of beer or cooler, a 5 ounce/150 ml glass of wine, or a drink containing 1 shot of liquor).

1. During the last 12 months, how often did you usually have any kind of drink containing alcohol? (Remember, by a drink we mean half an ounce (30 ml) of absolute alcohol (e.g. a 12 ounce/355 ml can or glass of beer or cooler, a 5 ounce/150 ml glass of wine, or a drink containing 1 shot of liquor). Choose only one.
   __ Every day
   __ 5 to 6 times a week
   __ 3 to 4 times a week
   __ twice a week
   __ once a week
   __ 2 to 3 times a month
   __ once a month
   __ 3 to 11 times in the past year
   __ 1 or 2 times in the past year
   __ I have not had a drink in the last 12 months

2. During the last 12 months, how many alcoholic drinks did you have on a typical day when you drank alcohol?
   __ 25 or more drinks
   __ 19 to 24 drinks
   __ 16 to 18 drinks
   __ 12 to 15 drinks
   __ 9 to 11 drinks
   __ 7 to 8 drinks
   __ 5 to 6 drinks
   __ 3 to 4 drinks
   __ 2 drinks
   __ 1 drink
   __ I have not had a drink in the last 12 months
3. During the last 12 months, what is the largest number of drinks containing alcohol that you drank within a 24-hour period?

___ 36 drinks or more
___ 24 to 35 drinks
___ 18 to 23 drinks
___ 12 to 17 drinks
___ 8 to 11 drinks
___ 5 to 7 drinks
___ 4 drinks
___ 3 drinks
___ 2 drinks
___ 1 drink
___ I have not had a drink in the last 12 months

4. During the last 12 months, how often did you drink this largest number of drinks? Choose only one.

___ Every day
___ 5 to 6 times a week
___ 3 to 4 times a week
___ twice a week
___ once a week
___ 2 to 3 times a month
___ once a month
___ 3 to 11 times in the past year
___ 1 or 2 times in the past year
___ I have not had a drink in the last 12 months

5. A) FOR FEMALES ONLY: During the last 12 months, how often did you have 4 or more drinks containing any kind of alcohol in within a two-hour period? [That would be the equivalent of at least 4 12-ounce cans or bottles of beer, 4 five ounce glasses of wine, 4 drinks each containing one shot of liquor or spirits] Choose only one.

___ Every day
___ 5 to 6 days a week
___ 3 to 4 days a week
___ two days a week
___ one day a week
___ 2 to 3 days a month
___ one day a month
___ 3 to 11 days in the past year
___ 1 or 2 days in the past year
___ 0 days in the past year
___ N/A I am male

5. B) FOR MALES ONLY: During the last 12 months, how often did you have 5 or more drinks containing any kind of alcohol in within a two-hour period? [That would be the
equivalent of at least 5 12-ounce cans or bottles of beer, 5 five ounce glasses of wine, 5 drinks each containing one shot of liquor or spirits] Choose only one.

___ Every day
___ 5 to 6 days a week
___ 3 to 4 days a week
___ two days a week
___ one day a week
___ 2 to 3 days a month
___ one day a month
___ 3 to 11 days in the past year
___ 1 or 2 days in the past year
___ 0 days in the past year
___ N/A I am female

6. During your lifetime, what is the largest number of drinks containing alcohol that you drank within a 24-hour period?
___ 36 drinks or more
___ 24 to 35 drinks
___ 18 to 23 drinks
___ 12 to 17 drinks
___ 8 to 11 drinks
___ 5 to 7 drinks
___ 4 drinks
___ 3 drinks
___ 2 drinks
___ 1 drink
___ I have not had a drink in my life

7. How old were you when you first drank alcohol on your own (more than a few sips), without your parents' permission?
___ 25 years old or older
___ 24 years old
___ 23 years old
___ 22 years old
___ 21 years old
___ 20 years old
___ 19 years old
___ 18 years old
___ 17 years old
___ 16 years old
___ 15 years old
___ 14 years old
___ 13 years old
___ 12 years old
___ 11 years old
___ 10 years old
___ Younger than 10 [Please specify age______________]
___ I have not had a drink in my life
8. How old were you when you first felt drunk, high or intoxicated from alcohol?

___ 25 years old or older
___ 24 years old
___ 23 years old
___ 22 years old
___ 21 years old
___ 20 years old
___ 19 years old
___ 18 years old
___ 17 years old
___ 16 years old
___ 15 years old
___ 14 years old
___ 13 years old
___ 12 years old
___ 11 years old
___ 10 years old
___ Younger than 10 [Please specify age______________]
___ I never have felt this way in my life
## Appendix D

### Drug Use Questionnaire

For each drug listed below, circle the one category which best fits you.

<table>
<thead>
<tr>
<th>Drug Description</th>
<th>Never Used</th>
<th>Tried But Quit</th>
<th>Several Times a Year</th>
<th>Several Times a Month</th>
<th>Week-Ends Only</th>
<th>Several Times a Week</th>
<th>Daily</th>
<th>Several Times a Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marijuana or Hashish</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>LSD, Psilocybin, Peyote, other hallucinogens (ACID)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Amphetamines (speed, crank, Whites, Black Cadillacs, Meth)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Cocaine (Coke, crack, snow)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Barbiturates (Quaaludes, Sopers, downers, reds)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>PCP (angel dust)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Heroin (smack, horse)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Other Opiates (opium, morphine, oxycontin etc.)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Valium, other tranquilizers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Ecstasy (MDMA, XTC)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>
Mortality Risk Appraisal

The overall mortality rate in Canada is approximately 225,000 deaths per year. Please indicate how many of those deaths you believe were due to the following activities. NOTE: These activities are not the only causes of death in Canada and therefore, your total for these activities does not need to add to 225,000.

1) Alcohol consumption
2) Using handguns
3) Receiving vaccinations
4) Using illegal drugs other than marijuana or heroin
5) Police work
6) Sky Diving
7) Boating (in a lake or ocean)
8) Riding motorcycles
9) Swimming (in a lake or ocean)
10) Shooting heroin
11) Street racing
12) Driving automobiles/trucks
13) Mountain Climbing
14) Horseback Riding
15) Fire fighting
16) Riding a bicycle
17) Swimming (in a pool)
18) Smoking marijuana
19) Pregnancy/childbirth
20) Air transportation (private)
21) Air transportation (commercial)
22) Skiing/snowboarding
23) Surfing
24) Smoking tobacco cigarettes
25) Water skiing
**Risk Ranking - Self**

If you were to engage in each of the activities below, please rate your likelihood of a negative outcome occurring (e.g. death, physical pain, emotional pain, negative social judgement, reduced health, etc.) for each. Please rank the activities in order from 1 to 20 (where 1 is the most risky and 20 is the least risky).

1) Swimming (in a lake or ocean)  
2) Cooking  
3) Using handguns  
4) Smoking marijuana  
5) Shooting heroin  
6) Horseback riding  
7) Alcohol consumption  
8) Playing high-school or college contact sports (e.g. hockey, football, etc...)  
9) Skiing/snowboarding  
10) Smoking tobacco cigarettes  
11) Street racing  
12) Riding a motorcycle  
13) Using air transportation (private)  
14) Surfing  
15) Sky diving  
16) Drinking coffee  
17) Mountain climbing  
18) Sexual intercourse  
19) Driving an automobile/truck  
20) Riding a bicycle
Benefit Ranking - Self

If you were to engage in each of the activities below, please rate your likelihood of a positive outcome occurring (e.g., increased life-span, physical pleasure, emotional pleasure, positive social judgement, improved health, etc.) for each. Please rank the activities in order from 1 to 20 (where 1 is the most beneficial and 20 is the least beneficial).

1) Swimming (in a lake or ocean)  
2) Cooking  
3) Using handguns  
4) Smoking marijuana  
5) Shooting heroin  
6) Horseback riding  
7) Alcohol consumption  
8) Playing high-school or college contact sports (e.g. hockey, football, etc...)  
9) Skiing/snowboarding  
10) Smoking tobacco cigarettes  
11) Street racing  
12) Riding a motorcycle  
13) Using air transportation (private)  
14) Surfing  
15) Sky diving  
16) Drinking coffee  
17) Mountain climbing  
18) Sexual intercourse  
19) Driving an automobile/truck  
20) Riding a bicycle
Risk Ranking - Peers

For your peers (people close to your age including people you don’t know) who engage in each of the activities below, please rate their likelihood of a negative outcome occurring (e.g., death, physical pain, emotional pain, negative social judgement, reduced health, etc.) for each. Please rank the activities in order from 1 to 20 (where 1 is the most risky and 20 is the least risky).

<table>
<thead>
<tr>
<th></th>
<th>Activity</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Swimming (in a lake or ocean)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cooking</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Using handguns</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Smoking marijuana</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Shooting heroin</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Horseback riding</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Alcohol consumption</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Playing high-school or college contact sports (e.g. hockey, football, etc...)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Skiing/snowboarding</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Smoking tobacco cigarettes</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Street racing</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Riding a motorcycle</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Using air transportation (private)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Surfing</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sky diving</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Drinking coffee</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Mountain climbing</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Sexual intercourse</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Driving an automobile/truck</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Riding a bicycle</td>
<td></td>
</tr>
</tbody>
</table>
**Benefit Ranking - Peers**

For *your peers* (people close to your age, including people you don't know) who engage in each of the activities below, please rate their likelihood of a positive outcome occurring (e.g. increased life-span, physical pleasure, emotional pleasure, positive social judgement, improved health, etc.) for each. Please rank the activities in order from 1 to 20 (where 1 is the most beneficial and 20 is the least beneficial).

<table>
<thead>
<tr>
<th>Rank</th>
<th>Activity</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Swimming (in a lake or ocean)</td>
<td></td>
</tr>
<tr>
<td>2)</td>
<td>Cooking</td>
<td></td>
</tr>
<tr>
<td>3)</td>
<td>Using handguns</td>
<td></td>
</tr>
<tr>
<td>4)</td>
<td>Smoking marijuana</td>
<td></td>
</tr>
<tr>
<td>5)</td>
<td>Shooting heroin</td>
<td></td>
</tr>
<tr>
<td>6)</td>
<td>Horseback riding</td>
<td></td>
</tr>
<tr>
<td>7)</td>
<td>Alcohol consumption</td>
<td></td>
</tr>
<tr>
<td>8)</td>
<td>Playing high-school or college contact sports (e.g. hockey, football, etc...)</td>
<td></td>
</tr>
<tr>
<td>9)</td>
<td>Skiing/snowboarding</td>
<td></td>
</tr>
<tr>
<td>10)</td>
<td>Smoking tobacco cigarettes</td>
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</tr>
<tr>
<td>11)</td>
<td>Street racing</td>
<td></td>
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<tr>
<td>12)</td>
<td>Riding a motorcycle</td>
<td></td>
</tr>
<tr>
<td>13)</td>
<td>Using air transportation (private)</td>
<td></td>
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<tr>
<td>14)</td>
<td>Surfing</td>
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</tr>
<tr>
<td>15)</td>
<td>Sky diving</td>
<td></td>
</tr>
<tr>
<td>16)</td>
<td>Drinking coffee</td>
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<td>17)</td>
<td>Mountain climbing</td>
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<td>18)</td>
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<td>20)</td>
<td>Riding a bicycle</td>
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**Frequency of engagement - Self**

Please estimate how often you have engaged in the following activities:

1) **Swimming (in a lake or ocean)**

   - Never
   - Daily
   - Several times a week
   - Several times a month
   - Several times in the past year
   - Once or twice in the past year
   - In the past: frequently but not in the past year
   - In the past: but not frequently

2) **Cooking**

   - Never
   - Daily
   - Several times a week
   - Several times a month
   - Several times in the past year
   - Once or twice in the past year
   - In the past: frequently but not in the past year
   - In the past: but not frequently

3) **Using handguns**

   - Never
   - Daily
   - Several times a week
   - Several times a month
   - Several times in the past year
   - Once or twice in the past year
   - In the past: frequently but not in the past year
   - In the past: but not frequently

4) **Smoking marijuana**

   - Never
   - Daily
   - Several times a week
   - Several times a month
   - Several times in the past year
   - Once or twice in the past year
   - In the past: frequently but not in the past year
   - In the past: but not frequently
5) Shooting heroin
   _____ Never
   _____ Daily
   _____ Several times a week
   _____ Several times a month
   _____ Several times in the past year
   _____ Once or twice in the past year
   _____ In the past: frequently but not in the past year
   _____ In the past: but not frequently

6) Horseback riding
   _____ Never
   _____ Daily
   _____ Several times a week
   _____ Several times a month
   _____ Several times in the past year
   _____ Once or twice in the past year
   _____ In the past: frequently but not in the past year
   _____ In the past: but not frequently

7) Alcohol consumption
   _____ Never
   _____ Daily
   _____ Several times a week
   _____ Several times a month
   _____ Several times in the past year
   _____ Once or twice in the past year
   _____ In the past: frequently but not in the past year
   _____ In the past: but not frequently

8) Playing high-school or college contact sports (e.g. hockey, football, etc...)
   _____ Never
   _____ Daily
   _____ Several times a week
   _____ Several times a month
   _____ Several times in the past year
   _____ Once or twice in the past year
   _____ In the past: frequently but not in the past year
   _____ In the past: but not frequently
9) Skiing/snowboarding
   ______ Never
   ______ Daily
   ______ Several times a week
   ______ Several times a month
   ______ Several times in the past year
   ______ Once or twice in the past year
   ______ In the past: frequently but not in the past year
   ______ In the past: but not frequently

10) Smoking tobacco cigarettes
    ______ Never
    ______ Daily
    ______ Several times a week
    ______ Several times a month
    ______ Several times in the past year
    ______ Once or twice in the past year
    ______ In the past: frequently but not in the past year
    ______ In the past: but not frequently

11) Street racing
    ______ Never
    ______ Daily
    ______ Several times a week
    ______ Several times a month
    ______ Several times in the past year
    ______ Once or twice in the past year
    ______ In the past: frequently but not in the past year
    ______ In the past: but not frequently

12) Riding a motorcycle
    ______ Never
    ______ Daily
    ______ Several times a week
    ______ Several times a month
    ______ Several times in the past year
    ______ Once or twice in the past year
    ______ In the past: frequently but not in the past year
    ______ In the past: but not frequently
13) Using air transportation (private)
   ______ Never
   ______ Daily
   ______ Several times a week
   ______ Several times a month
   ______ Several times in the past year
   ______ Once or twice in the past year
   ______ In the past: frequently but not in the past year
   ______ In the past: but not frequently

14) Surfing
   ______ Never
   ______ Daily
   ______ Several times a week
   ______ Several times a month
   ______ Several times in the past year
   ______ Once or twice in the past year
   ______ In the past: frequently but not in the past year
   ______ In the past: but not frequently

15) Sky diving
   ______ Never
   ______ Daily
   ______ Several times a week
   ______ Several times a month
   ______ Several times in the past year
   ______ Once or twice in the past year
   ______ In the past: frequently but not in the past year
   ______ In the past: but not frequently

16) Drinking coffee
   ______ Never
   ______ Daily
   ______ Several times a week
   ______ Several times a month
   ______ Several times in the past year
   ______ Once or twice in the past year
   ______ In the past: frequently but not in the past year
   ______ In the past: but not frequently
17) Mountain climbing
   _____ Never
   _____ Daily
   _____ Several times a week
   _____ Several times a month
   _____ Several times in the past year
   _____ Once or twice in the past year
   _____ In the past: frequently but not in the past year
   _____ In the past: but not frequently

18) Sexual intercourse
   _____ Never
   _____ Daily
   _____ Several times a week
   _____ Several times a month
   _____ Several times in the past year
   _____ Once or twice in the past year
   _____ In the past: frequently but not in the past year
   _____ In the past: but not frequently

19) Driving an automobile/truck
   _____ Never
   _____ Daily
   _____ Several times a week
   _____ Several times a month
   _____ Several times in the past year
   _____ Once or twice in the past year
   _____ In the past: frequently but not in the past year
   _____ In the past: but not frequently

20) Riding a bicycle
   _____ Never
   _____ Daily
   _____ Several times a week
   _____ Several times a month
   _____ Several times in the past year
   _____ Once or twice in the past year
   _____ In the past: frequently but not in the past year
   _____ In the past: but not frequently
## Appendix F

### Test-Retest and Cross-Format Correlations in Concurrent Study.

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Note: Paper Only participants completed a paper version of the questionnaires at both Time 1 and Time 2 (7-14 days apart), Online Only participant completed an online version of the questionnaires at both Time 1 and Time 2 (7-14 days apart), Cross-Method participants completed one paper and one online format counter-balanced for Time 1 and Time 2 (7-14 days apart). Alc Max LT = the natural log transformation of the lifetime maximum number of drinks consumed in a 24-hour period, Est Alc Yr = the natural log.
transformation of the quantity x frequency of drinks consumed in the past year, Cannabis = pattern of cannabis use, BIS_Total = Barratt Impulsiveness Scale 11Total Score, SSSV = Sensation Seeking Scale-V, ES_NS = Experience Seeking with substance related questions removed, TAS = Thrill and Adventure Seeking, DIS_NS = Disinhibition with substance related questions removed, BS = Boredom Susceptibility. Total = total score, Alc Mort (Z-Score) = the Z transformation of the estimated number of deaths per year due to alcohol use, Net RA Alc S = net risk appraisal for alcohol use for self, Net RA Alc P = net risk appraisal for alcohol use for peers, RS Alcohol = perceived risk to self for alcohol use, BS Alcohol = perceived benefits to self for alcohol use, RP Alcohol = perceived risk to peers for alcohol use, BP Alcohol = perceived benefits to peers for alcohol use, Spearman correlations were used for ordinal variables: RS Alcohol, BS Alcohol, RP Alcohol, and BP Alcohol, all others are Pearson correlations. Statistically significant results are presented in bold text.

~ p ≤ .1; ** p ≤ .01; *** p ≤ .001.
Appendix G

UBC Research Ethics Board’s Certificates of Approval.

The University of British Columbia
Office of Research Services
Behavioural Research Ethics Board
Suite 102, 6190 Agronomy Road,
Vancouver, B.C. V6T 1Z3

CERTIFICATE OF APPROVAL - FULL BOARD

<table>
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<th>PRINCIPAL INVESTIGATOR:</th>
<th>INSTITUTION / DEPARTMENT:</th>
<th>UBC BREB NUMBER:</th>
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<td>Scott Carlson</td>
<td>UBC/Arts/Psychology, Department of</td>
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INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:

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Other locations where the research will be conducted:
None

CO-INVESTIGATOR(S):
Season Johnson

SPONSORING AGENCIES:
N/A

PROJECT TITLE:
Risk Appraisal and Personality Differences in Substance Users and Non-Users

REB MEETING DATE: November 8, 2007
CERTIFICATE EXPIRY DATE: November 8, 2008

DOCUMENTS INCLUDED IN THIS APPROVAL:

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The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.

Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:

Dr. M. Judith Lynam, Chair
### Certificate of Approval - Full Board

**Principal Investigator:** Scott Carlson  
**Institution / Department:** UBC/Arts/Psychology, Department of  
**UBC BREB Number:** H08-02132

**Institution(s) Where Research Will Be Carried Out:**

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**CO-Investigator(s):**  
Season Johnson

**Sponsoring Agencies:**  
N/A

**Project Title:**  
For Males Only: Risk Appraisal and Personality Differences in Substance Users and Non-Users

**REB Meeting Date:** September 25, 2008  
**Certificate Expiry Date:** September 25, 2009

**Documents Included in This Approval:**

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**CERTIFICATE OF APPROVAL - FULL BOARD**

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Other locations where the research will be conducted:
None

**CO-INVESTIGATOR(S):**
Season Johnson

**SPONSORING AGENCIES:**
N/A

**PROJECT TITLE:**
Risk Appraisal, Personality Differences, and Substance Use (Consistency Study)

**REB MEETING DATE:**
January 10, 2008

**CERTIFICATE EXPIRY DATE:**
January 10, 2009

**DOCUMENTS INCLUDED IN THIS APPROVAL:**

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Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:

Dr. M. Judith Lynam, Chair
Dr. Ken Craig, Chair
Dr. Jim Rupert, Associate Chair
Dr. Laurie Ford, Associate Chair
Dr. Daniel Salhani, Associate Chair

Dr. Anita Ho, Associate Chair

The University of British Columbia
Office of Research Services
Behavioural Research Ethics Board
Suite 102, 6190 Agronomy Road,
Vancouver, B.C. V6T 1Z3

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Other locations where the research will be conducted:
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CO-INVESTIGATOR(S):
Season Johnson

SPONSORING AGENCIES:
N/A

PROJECT TITLE:
For Males Only: Risk Appraisal, Personality Differences, and Substance Use (Consistency Study)

REB MEETING DATE: September 25, 2008
CERTIFICATE EXPIRY DATE: September 25, 2009

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<td><a href="http://www.surveymonkey.com">http://www.surveymonkey.com</a> [Note: the webpage will be enacted once we receive BREB approval and]</td>
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The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.

Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:

Dr. M. Judith Lynam, Chair
Dr. Ken Craig, Chair
Dr. Jim Rupert, Associate Chair
Dr. Laurie Ford, Associate Chair
Dr. Daniel Salhani, Associate Chair
Dr. Anita Ho, Associate Chair