A Novel Evaluation of Alcohol Sensitivity in the Context of the Acquired Preparedness Model

by

Laura Heath

A thesis submitted in conformity with the requirements for the degree of Master of Arts
Department of Psychological Clinical Science
University of Toronto

© Copyright by Laura Heath (2018)
A Novel Evaluation of Alcohol Sensitivity in the Context of the Acquired Preparedness Model

Laura Heath

Master of Arts

Department of Psychological Clinical Science
University of Toronto

2018

Abstract

The acquired preparedness model (APM) posits that the relationships between impulsivity and alcohol misuse are indirectly influenced through the biased acquisition of positive versus negative expectancies for the effects of alcohol. The present study assessed whether self-reported sensitivity to the lower dose/stimulant and heavier dose/sedative effects of alcohol would indirectly influence the impulsivity-expectancy relationship and drinking quantity and problems. Structural equation modeling was performed on cross-sectional, self-report data from 300 young adult heavy drinkers. Alcohol sensitivity was unrelated to impulsivity or alcohol expectancies, but each variable had unique associations with drinking outcomes, suggesting that alcohol sensitivity does not contribute to the APM. Lower alcohol sensitivity was directly associated with drinking outcomes. There were also positive, indirect effects in the traditional APM between impulsivity and drinking variables via positive and negative expectancies. Future research should try to replicate the model in a longitudinal sample to confirm temporal sequencing of relationships.
Acknowledgements

I would first like to express my gratitude to my supervisor, Dr. Christian Hendershot. Your mentorship, expertise, and work ethic have made an incredible impact on my development as a researcher. I also want to thank my co-supervisor, Dr. Amanda Uliaszek, and committee member, Dr. R Michael Bagby, for their valuable feedback on this work and their guidance throughout my graduate studies. I am so fortunate to have the opportunity to continue learning from all of you for several years to come.

I also want to thank all of the members of the BARlab. Dr. Jeffrey Wardell, thank you for your contribution to my knowledge of structural equation modeling and your valuable input towards the analytical plan and discussion of this manuscript and other lab projects. Thank you to Matthew McPhee, for being my go-to lab buddy whom I can always bounce ideas off.

I could not have completed this degree without the support of my cohort, Shauna, Thulasi, Angie, and Kevin. Your friendships and intelligence have been instrumental to my personal and professional growth over the past two years. I could not have asked for a better group of humans with whom to share this experience.

Thanks to my friends and family for your love and support. To my parents, thank you for always encouraging me to pursue what I love, no matter how long it takes…

Finally I would like to thank all of the participants involved in this project for sharing their experiences and for allowing this research to progress.
# Table of Contents

Acknowledgements ........................................................................................................... iii

Table of Contents ................................................................................................................ iv

List of Tables ........................................................................................................................ vi

List of Figures ....................................................................................................................... vii

1 Introduction ....................................................................................................................... 1

1.1 Disinhibition and alcohol use ....................................................................................... 1

1.2 The role of alcohol expectancies on drinking ............................................................... 2

1.3 The acquired preparedness model ............................................................................... 3

1.4 Alcohol sensitivity ....................................................................................................... 6

1.5 The present study ....................................................................................................... 9

1.6 Hypotheses ................................................................................................................ 10

2 Method ............................................................................................................................. 14

2.1 Participants ................................................................................................................ 14

2.2 Sampling procedures ................................................................................................. 14

2.3 Measures ................................................................................................................... 15

2.3.1 UPPS-P Impulsive Behavior Scale ........................................................................ 15

2.3.2 Alcohol Sensitivity Questionnaire ........................................................................ 15

2.3.3 Comprehensive Effects of Alcohol Questionnaire ............................................... 16

2.3.4 Timeline Followback ............................................................................................ 16

2.3.5 Rutgers Alcohol Problems Index .......................................................................... 17

2.4 Statistical Analyses .................................................................................................. 17

2.4.1 Principal Component Analysis ............................................................................. 17

2.4.2 Structural Equation Modeling .............................................................................. 18

3 Results ............................................................................................................................. 20

3.1 PCA of the ASQ ....................................................................................................... 20
3.2 Models ................................................................................................................. 21
  3.2.1 Model 1: Traditional APM ........................................................................... 22
  3.2.2 Model 2: APM + ASQ .................................................................................. 24
  3.2.3 Model 3: APM with ASQ ............................................................................. 25

4 Discussion .................................................................................................................. 27
  4.1 Subscales of the ASQ ......................................................................................... 27
  4.2 Traditional APM .................................................................................................. 27
  4.3 Addition of alcohol sensitivity to the APM ...................................................... 30
  4.4 Limitations .......................................................................................................... 32

5 Conclusions ............................................................................................................... 32

6 References ................................................................................................................. 34
List of Tables

Table 1. Pattern matrix of the revised Alcohol Sensitivity Questionnaire

Table 2. Means, standard deviations, and correlations among variables in the model

Table 3. Model 1: Estimates of indirect associations

Table 4. Model 2: Estimates of indirect associations

Table 5: Model 3: Estimates of indirect associations
List of Figures

Figure 1. Hypothesized path model 1
Figure 2. Hypothesized path model 2
Figure 3. Hypothesized path model 3
Figure 4. Model 1 with only significant paths displayed
Figure 5. Model 2 with only significant paths displayed
Figure 6. Model 3 with only significant paths displayed
1 Introduction

1.1 Disinhibition and alcohol use

Traits of disinhibition, such as impulsivity and sensation seeking, have been frequently implicated as risk factors for increased drinking frequency, quantity, and alcohol-related problems (Coskunpinar, Dir, & Cyders, 2013; Dick et al., 2010; Magid, MacLean, & Colder, 2007). The personality trait of impulsivity has been subdivided into many facets that can be measured by a multitude of instruments. One model of trait impulsivity, abbreviated as UPPS, has identified four distinct dimensions: 1) urgency; 2) lack of preméditation/planning; 3) lack of perseverance; and 4) sensation seeking (Whiteside et al. 2005). The UPPS model of trait impulsivity was developed to try to “bring structure to the diversity of impulsivity conceptions and measures” (Whiteside & Lynam, 2001, p.674). Factor analysis was conducted on seventeen widely used impulsivity scales as well as the four facets of impulsivity from the Five-Factor Model of personality (McCrae and Costa, 1990). The resulting UPPS model accounted for 66% of the variance in the impulsivity instruments (Whiteside and Lynam, 2001). Further model testing determined that lack of preméditation/planning and lack of perseverance were two distinct facets of a hierarchical latent factor, and sensation seeking and urgency were separate constructs, sharing only 4% of their variance with each other (Smith et al., 2007). Researchers have further extended this model into the UPPS-P, delineating urgency into positive and negative facets, which refer to the disposition to act impulsively in response to extremely positive and negative emotions, respectively (Cyders and Smith, 2007, 2008).

In a meta-analysis of the relationship between alcohol use and the UPPS-P facets of impulsivity conducted by Coskunpinar, Dir, & Cyders (2013), evidence emerged to support negative urgency as the primary impulsivity-related trait implicated in alcohol-
related problems ($r = .35$), including behaviours such as role failures, feelings of guilt or remorse, blackouts, and alcohol-related injuries that in part comprise the *DSM-5* criteria for alcohol use disorder (AUD; American Psychiatric Association, 2013). Positive urgency was also highly related to drinking problems ($r = .34$; Coskunpinar et al., 2013) and has predicted drinking onset and consumption increases from grade 5 to 6 (Settles, Zapolski, & Smith, 2014) and increases in illegal drug use and risky sexual behaviour in the first year of college (Zapolski, Cyders, & Smith, 2009). Sensation seeking had the largest effect size for binge drinking ($r = .36$; Coskunpinar et al., 2013). When all traits are considered, sensation seeking and urgency appear to be more consistently predictive of concurrent and prospective risky behaviour than lack of perseverance or premeditation/planning (Cyders and Smith, 2008; Smith et al., 2007).

### 1.2 The role of alcohol expectancies on drinking

The acquisition of learned beliefs about the effects of alcohol – also referred to as alcohol expectancies – play a role in drinking behaviour and emerge as early as elementary school (Anderson et al., 2005). Positive alcohol expectancies involve the anticipation of reinforcement from drinking and have been positively associated with the initiation and maintenance of maladaptive alcohol use (Barnow et al., 2004; Bekman et al., 2011; Carlson & Johnson, 2012). Examples of positive expectancies of alcohol include the beliefs that drinking leads to increased social aptitude and tension reduction. Negative alcohol expectancies include cognitive/behavioural impairment, negative self-perception, and risk and aggression. The majority of studies have shown that drinking behaviour is positively associated with positive expectancies and negatively associated with negative expectancies (for review, see Jones, Corbin & Fromme, 2001). However, McMahon and colleagues (1994) found that negative alcohol expectancies were
positively correlated with drinking frequency and quantity among male and female social drinkers. Expectancies related to cognitive impairment and aggression were associated with higher alcohol-related problems among individuals aged 18-24 years (Pabst, Kraus, Piontek, Mueller, & Demmel, 2014). Furthermore, some studies only examined positive expectancies (Barnow et al., 2004; Carlson & Johnson, 2012; Corbin et al., 2015; Fischer, Settles, Collins, Gunn, & Smith, 2012), so the relationship between negative expectancies and drinking outcomes is less clear.

1.3 The acquired preparedness model

The Acquired Preparedness Model (APM) posits that personality traits related to impulsivity influence drinking indirectly through the differential acquisition of learned beliefs about the effects of alcohol (Smith & Anderson, 2001). This theory is based on Patterson and Newman’s (1993) conceptualization of trait disinhibition, whereby individuals high on the disinhibited personality trait are predisposed to focus on the positive, reinforcing qualities of their environment, and to fail to adequately learn the negative, punishing effects.

In seminal research, McCarthy, Kroll, & Smith (2001) tested the APM using a personality questionnaire to classify disinhibited males in one study and the go/no-go discrimination task to verify the reward-based response style of males and females with high disinhibition in a second study. Results supported the theory of the APM by demonstrating that disinhibition had an indirect association with drinking behaviour via positive expectancies of alcohol among men, but the model was not replicated among women. Anderson, Smith, & Fischer (2003) extended the findings to include negative alcohol expectancies in a sample of college women. Higher levels of disinhibition, measured using a combination of personality-based self-reports of sensation seeking,
impulsivity, and novelty seeking, were associated with lower negative expectancies, which were in turn associated with increased levels of drinking quantity and frequency. The inverse results were found for positive expectancies, whereby greater disinhibition related to greater positive expectancies, which were positively related to alcohol consumption. More recently, Corbin and colleagues (2015) found that a combined measure of self-reported impulsivity and sensation seeking was associated with greater positive expectancies, which in turn was associated with heavier drinking and related problems.

The inconsistent use of different uni-dimensional measures of impulsivity has limited our understanding of the APM finding that alcohol expectancies serve as a mediator between disinhibition/impulsivity and drinking (Anderson et al., 2003; Corbin, Iwamoto, & Fromme, 2011; Fu, Ko, Wu, Cherng, & Cheng, 2007; Read & O’Connor, 2006).

Using the UPPS instrument can help to clarify the aspects of impulsivity that are implicated in the APM by examining positive and negative urgency and sensation seeking, which have been the most consistently implicated impulsivity traits related to drinking outcomes.

Two studies have tested APM predictions using at least some of the domains of the UPPS-P. In a three-wave longitudinal study of college students, positive and negative urgency both predicted drinking quantity through different pathways; the effect of positive urgency was mediated by positive alcohol expectancies and negative urgency was mediated by the motive to drink alcohol to cope with distress (Settles, Cyders, & Smith, 2010). Research has shown that drinking motives and expectancies are distinct constructs (Kuntsche, Wiers, Janssen, & Gmel, 2010) and the study by Settles et al.
(2010) did not measure negative alcohol expectancies, limiting interpretation of the findings.

Using the UPPS measure among Asian Americans, the significant correlations between positive alcohol expectancies and urgency, (lack of) premeditation, and sensation seeking accounted for the relationships between impulsivity domains and alcohol consumption, but there was no indirect effect of negative expectancies (Han & Short, 2009). However, several of the findings in this study are inconsistent with the established literature; for example, alcohol expectancies did not mediate the relationship between impulsivity domains and drinking outcomes among the Caucasian sample in the study. The dearth of studies including both the UPPS measure of impulsivity and negative alcohol expectancies again makes it difficult to interpret findings.

It is also important to be cognizant that the degree to which alcohol expectancies mediate the relationship between impulsivity and drinking quantity is clearer than the effects on alcohol-related problems (e.g., tolerance/withdrawal, problems in relationships, work, school while drinking or as a result of drinking). For example, two longitudinal studies among Chinese (Fu et al., 2007) and U.S. college students (Corbin, Iwamoto, & Fromme, 2011) found that positive expectancies mediated the relationship between self-reported trait disinhibition and both alcohol use and alcohol related-problems. Both studies found no evidence for mediation by negative expectancies. In contrast, positive expectancies were a mediator between disinhibition and drinking, but not alcohol-related problems among a college sample; negative expectancies were not measured (McCarthy, Miller, Smith, & Smith, 2001).
1.4 Alcohol sensitivity

Although the traditional formulation of the APM emphasizes learned expectancies as the mechanism that links impulsivity with drinking outcomes, variation in alcohol sensitivity may be relevant as a potential learning mechanism for how or why trait disinhibition influences differential acquisition of alcohol expectancies. Individual differences in subjective response to alcohol – also referred to as alcohol sensitivity – have been identified as risk factors for heavy drinking, alcohol problems, and the development of AUD (for recent reviews see Morean & Corbin, 2010; Quinn & Fromme, 2011). The subjective responses to alcohol have largely been described as biphasic, with individuals generally experiencing positive, stimulant effects as breath alcohol concentration (BrAC) rises on the ascending limb of the blood alcohol curve (BAC), and aversive, sedative effects as BrAC declines on the descending limb of the BAC (Boyd, Corbin, Morean, & Martin, 2017; Newlin & Thomson, 1990; Ray, MacKillop, Leventhal, Hutchison, 2009; Roche, Palmeri, & King, 2014).

The Self-Rating of the Effects of Alcohol (SRE) measure is the most widely used instrument to assess self-reported subjective response to alcohol as an alternative to conducting alcohol challenge studies (Ray, Hart, & Chin, 2011). The SRE asks participants to report the number of drinks required to feel: different; dizzy or have slurred speech; begin stumbling; and pass out (Schuckit et al., 2007). Although this scale may provide a measure of low level of response to alcohol, it is reflective of the aversive, sedative effects of alcohol and does not include positive, stimulant effects.

In response to limitations of the current self-report measures of alcohol sensitivity, the Alcohol Sensitivity Questionnaire (ASQ) was developed to sample a wider range of alcohol effects that include the lighter dose, mostly stimulant responses in addition to
heavier dose, sedative responses to alcohol (Fleming et al., 2016). The ASQ lighter dose/stimulant and heavier dose/sedative subscales have been shown to be relatively better predictors of stimulation and sedation, respectively, following acute alcohol challenge, compared to the SRE (Fleming et al., 2016). The availability of a scale to measure a fuller range of responses to alcohol could augment the methods currently employed in studies examining alcohol sensitivity in relation to drinking predictors and outcomes.

Two validated models have been used to study the effects of subjective response to alcohol on drinking outcomes. The Low Level of Response (LLR) Model posits that decreased sensitivity to alcohol confers risk for negative drinking outcomes (Ray, Mackillop, & Monti, 2010; Schuckit et al., 2000). While the differentiator model (DM) states that those at risk for AUDs may be more sensitive to the positive, stimulant effects of alcohol on the ascending limb of the BAC and less responsive to the aversive, sedative effects as BAC is falling (descending limb), based on evidence for the biphasic effects of alcohol (Newlin & Thomson, 1990). Evidence from King and colleagues (2011) has suggested a modified DM that emphasizes the association between heavier drinking and greater stimulant/lower sedative effects of alcohol regardless of position on the BAC. The LLR and DM models have established strong empirical support, suggesting two distinct sets of phenotypic risk. The low overall sensitivity to alcohol has been demonstrated primarily in individuals with a family history of alcoholism, signifying a heritable risk for AUD (Morean & Corbin, 2010; Quinn & Fromme, 2011); whereas the modified DM suggests that greater sensitivity to the rewarding, stimulant effects and lower sensitivity to the aversive, sedative effects confers risk for greater drinking and related problems (King, McNamara, Hasin, & Cao, 2014).
Alcohol administration studies have suggested that subjective response to alcohol may play a role in the association between impulsivity, alcohol expectancies, and drinking as described by the APM. In a systematic review of laboratory studies that examined the interaction between impulsivity traits and alcohol administration on outcomes in humans, ten of thirteen studies found significant effects of impulsivity on subjective response to alcohol (Heath & Hendershot, in preparation). Self-reported impulsivity was associated with greater stimulant and lower sedative response to alcohol (Leeman et al., 2014). Hendershot et al. (2015) found that individuals with higher ADHD symptoms had a steeper increase on subjective stimulant response to alcohol, but there was no effect on sedation. Erblich and Earleywine (2003) found that behavioural undercontrol, a self-report measure of impulsivity, predicted greater stimulant responses to alcohol on the ascending limb. Furthermore, stimulant responses moderated the association between behavioural undercontrol and self-reported drinking. Nevertheless, some studies have found non-significant or equivocal findings for the relationship between impulsivity and subjective alcohol sensitivity in the lab (Magrys, Olmstead, Wynne-Edwards, & Balodis, 2013; Rose & Grunsell, 2008; Shannon, Staniforth, McNamara, Bernosky-Smith, & Liguori, 2011).

To determine if the relationship between impulsivity and alcohol expectancies may be attributable to the experiences of alcohol effects, Scott and Corbin (2014) assessed the association between sensation seeking and alcohol response using a placebo-controlled alcohol challenge. Alcohol sensitivity was measured by examining the reported stimulant and sedative effects following alcohol administration, and expectancies were measured as the response to placebo. Results demonstrated that higher levels of sensation seeking were associated with the experience of greater stimulation (ascending limb), but there
was no difference between alcohol and placebo, suggesting that sensation seeking is not uniquely related to response to alcohol, controlling for expectancies, and supports the current conceptualization of the APM (Scott & Corbin, 2014). There was no significant association between sensation seeking and sedation on the descending limb regardless of beverage condition, which is consistent with the mixed findings in the literature on the role of negative alcohol expectancies in the APM.

Despite the results from Scott and Corbin (2014), the considerable laboratory evidence for associations between impulsivity constructs and subjective response to alcohol, as evidenced by systematic review (Heath & Hendershot, in preparation), supports further evaluation of alcohol sensitivity as a possible intervening variable in the APM. The amount of studies focused on stimulant effects, and differential findings between stimulation and sedation (e.g., Leeman et al., 2014; Scott & Corbin, 2014) also supports the need to study stimulant- and sedative-like effects separately.

1.5 The present study
The study aimed to extend the APM to test the indirect effects of lighter dose/stimulant sensitivity on the relationships between impulsivity traits and positive alcohol expectancies, and the indirect effects of heavier dose/sedative sensitivity on the relationships between impulsivity and negative alcohol expectancies. Considering that the literature generally supports urgency and sensation seeking as the main impulsivity variables involved with drinking, only positive urgency, negative urgency, and sensation seeking were assessed in this study (Coskunpınar et al., 2013). The study employed the UPPS-P model of impulsivity, included both positive and negative expectancies, and examined alcohol outcomes of drinking quantity and problems to allow for a comprehensive understanding of how these factors influence drinking behaviours and to
address the limitations of previous studies. The theoretical model was investigated in a cross-sectional sample of young adult heavy drinkers from an archival database.

1.6 Hypotheses

In the first model (Figure 1), which tested the traditional APM, it was hypothesized that higher scores on all three traits of impulsivity would be associated with greater positive alcohol expectancies and fewer negative expectancies. Greater positive alcohol expectancies would be associated with greater drinking quantity and problems; greater negative expectancies would be associated with less drinking and related problems. Impulsivity variables would also have direct, positive associations with drinking quantity and problems, and there would be a partial indirect effect of expectancies on the impulsivity-drinking relationship. Based on findings from the literature that sensation seeking is not related to drinking problems, only positive and negative urgency would predict drinking-related problems. Female sex was also predicted to be associated with lower drinking quantity, based on evidence that men drink more than women (Wilsnack, Wilsnack, Kristjanson, Vogeltanz-Holm, & Gmel, 2009).
Two other models were tested to add the alcohol sensitivity variables into the model. First, sensitivity to the lighter dose/stimulant and heavier dose/sedative effects were tested as exogenous variables to examine the fit of a model that accounted for unique direct effects of impulsivity, alcohol expectancies, and alcohol sensitivity on drinking outcomes (Figure 2). In addition to the hypotheses described for model 1, it was hypothesized that greater sensitivity (lower ASQ scores) to the lighter dose/stimulant effects and lower sensitivity (higher ASQ scores) to the heavier dose/sedative effects would each be uniquely associated with greater drinking and related problems. Given the tendency for men to endorse a higher number of drinks than women, (Bartholow, Henry, & Lust, 2007), female sex was predicted to be associated with lower ASQ scores.
Figure 2. Hypothesized path model 2 with the addition of alcohol sensitivity as independent variables with direct paths to drinking outcomes. Paths of indirect effects are displayed in dashed lines. Sex: 1 = male; 2 = female.

To examine how alcohol sensitivity plays a role in the APM, a third model (Figure 3) was tested that examined the indirect effects of sensitivity in the relationship between impulsivity and expectancies. It was hypothesized that greater impulsivity would be associated with greater sensitivity (lower ASQ scores) to the lighter dose/stimulant effects of alcohol, which would in turn be related to greater positive expectancies. Greater impulsivity was predicted to be associated with lower sensitivity (higher ASQ scores) to the heavier dose/sedative effects of alcohol, which would in turn be related to lower negative expectancies. These indirect effects would partially mediate the relationships between impulsivity and expectancy variables. Subsequently, it was predicted that there would be indirect effects of positive and negative expectancies on the respective relationships between lighter dose/stimulant and heavier dose/sedative sensitivity and drinking outcomes.
Figure 3. Hypothesized path model 3 tested the relationship between alcohol sensitivity and impulsivity and expectancies in the context of the APM. Paths of indirect effects are displayed in dashed lines. Sex: 1 = male; 2 = female.
2 Method

2.1 Participants

Participants were heavy drinking young adults (N = 300; 53% women) who completed a baseline assessment as part of an experimental study of alcohol administration from an archival database affiliated with the primary supervisor (C.H.). Participants selected one or more of the following categories to describe their ethnic/racial background: Caucasian (n = 172; 57%), Asian (n = 43; 14%), Black/African American (n = 35; 12%), East Indian (n = 28; 9%), Hispanic/Latino (n = 26; 9%), Native North American (n = 9; 3%), and other (n = 42; 14%). Mean age was 19.75 ± 1.02(SD) and 76% (n = 227) were full-time students. Participants reported a mean of 19.10 ± 12.05 drinking days in the past 90 days, with an average of 5.08 ± 2.29 drinks per drinking day and 11.35 ± 10.77 episodes of heavy drinking, defined as 4 or more drinks for women and 5 or more drinks for men.

2.2 Sampling procedures

Recruitment consisted primarily of Internet advertisements on public and university websites targeting social drinkers in the Greater Toronto Area. Eligibility criteria included ages 18-25 years, at least one heavy drinking episode in the past month, no history of alcohol treatment or current desire to reduce drinking, no current psychiatric medications or disorders requiring treatment, no contraindications for alcohol use and no severe nicotine dependence. Individuals who recently used illicit drugs were excluded with the exception of cannabis.

Eligibility criteria were examined in an initial phone screening; informed consent and baseline assessment were conducted in-person at a laboratory at the Centre for Addiction and Mental Health (CAMH). Self-report measures were administered via a computer, and a trained interviewer collected information on alcohol use with the Timeline
Followback assessment. Participants received $40 upon completion of the baseline assessment. The institution’s Research Ethics Board approved the study procedure and consent form.

2.3 Measures

2.3.1 UPPS-P Impulsive Behavior Scale

The UPPS-P (Urgency, Premeditation, Perseverance, Sensation Seeking – with Positive Urgency; Lynam, Smith, Cyders, Fischer, & Whiteside, 2007) is a 59-item self-report instrument that measures several facets of trait impulsivity. Items are rated on a 4-point Likert scale (1 = disagree strongly to 4 = agree strongly) for the degree to which they describe the participant. As noted, this study is particularly interested in positive urgency (14 items; e.g., “When I am very happy, I can’t seem to stop myself from doing things that can have bad consequences”), negative urgency (12 items; e.g., “When I feel bad, I will often do things I later regret in order to make myself feel better now”) and sensation seeking (12 items; “I generally seek new and exciting experiences and sensations”).

Good internal consistency was observed in this sample, with coefficient alphas of 0.87, 0.86, and 0.80 for positive urgency, negative urgency, and sensation seeking, respectively.

2.3.2 Alcohol Sensitivity Questionnaire

The Alcohol Sensitivity Questionnaire (ASQ; Fleming et al., 2016) comprises 15 alcohol effects; 9 of the items are related to experiences typical of lighter dose, mostly stimulant response (e.g., talkative, “buzzed”, relaxed) and 6 items are reflective of heavier dose, sedative effects (e.g., nausea, blackouts). Participants indicate whether they have experienced each effect when drinking. For items endorsed, participants list the minimum number of standard drinks after which the effect is noticed (for lighter
drinking items) or the maximum number of drinks that could be consumed before noticing the effect (for heavier drinking items). Higher scores on the subscales indicate lower sensitivity, as a greater number of drinks are reportedly required to experience the effects. Items that were not endorsed at all – the participants reported never experiencing the effect – were recoded from 0 to missing, to prevent values of 0 from skewing the scales to inaccurately indicate greater sensitivity (lower ASQ scores). Principal component analysis (PCA) was conducted to examine the component loadings of ASQ items in the current study to ensure that the two subscales were distinct.

2.3.3 Comprehensive Effects of Alcohol Questionnaire

The Comprehensive Effects of Alcohol Questionnaire (CEOA; Fromme, Stroot, & Kaplan, 1993) is a 38-item self-report questionnaire that measures alcohol expectancies, identified as positive (e.g., sociability, tension reduction) and negative (e.g., cognitive and behavioural impairment, aggression). Participants are asked to rate the degree to which they would expect to experience the indicated effect of alcohol if they were drinking, on a scale from 1 = disagree to 4 = agree. As assessed by the CEOA, positive and negative expectancies have demonstrated unique predictive validity for drinking quantity and frequency, as well as sound psychometric properties (Fromme et al., 1993; Valdivia & Stewart, 2005). Coefficient alphas for positive and negative expectancies in the sample were .85 and .82, respectively.

2.3.4 Timeline Followback

The Timeline Followback (TLFB; Sobell & Sobell, 1992) is a structured calendar assessment of recent substance use that was used to calculate past 90-day drinking frequency and quantity. The TLFB method has demonstrated high reliability in its
administration to drinking populations (Sobell, Sobell, Klajner, Pavan, & Basian, 1986). Average drinks per drinking day were calculated to measure average drinking quantity.

2.3.5 Rutgers Alcohol Problems Index

The Rutgers Alcohol Problems Index (RAPI; White & Labouvie, 1989) is a 23-item instrument used to assess problems experienced as a result of drinking alcohol (e.g., tolerance/withdrawal symptoms, academic problems, social/interpersonal consequences). Each item is rated on a Likert scale from 0 = never to 4 = more than 10 times for the frequency of the problem related to drinking in the past year. The RAPI has demonstrated good psychometric properties (White & Labouvie, 1989). Coefficient alpha in this sample was .90.

2.4 Statistical Analyses

2.4.1 Principal Component Analysis

Principal component analysis (PCA) was conducted on the 15 items of the ASQ with oblique rotation (direct oblimin). PCA was chosen because the dimensions were linear components (as opposed to latent factors assessed with factor analysis) and the oblique rotation was used because of evidence in the literature that the lighter dose/stimulant and heavier dose/sedative factors are related. Parallel analysis was performed to compare the eigenvalues against eigenvalues in 1000 normally distributed, randomly generated datasets that have the same characteristics of the data being analyzed. All eigenvalues from the PCA that were greater than the eigenvalues generated from the corresponding random data were retained. This technique is superior to the traditional method of examining scree plots and setting an arbitrary significance of eigenvalues > 1 (Franklin, Gibson, Robertson, Pohlmann, & Fralish, 1995). Syntax was provided by O’Connor (2000).
2.4.2 Structural Equation Modeling

A path model in Mplus Version 7 (Muthén & Muthén, 2012) was constructed to examine the hypothesized models. In model 1, average drinks per drinking day (drinking quantity) and alcohol problems were regressed on positive and negative expectancies; positive and negative expectancies in turn were regressed on positive urgency, negative urgency, and sensation seeking. Alcohol variables were also regressed directly on impulsivity variables to control for direct associations. Drinking quantity and problems were regressed on positive and negative urgency; only drinking quantity was regressed on sensation seeking. Drinking quantity was also regressed on sex. Covariances were freely estimated among the impulsivity variables, and residual covariances were freely estimated among the expectancy and alcohol variables, respectively. Based on significant bivariate correlations, covariances were also freely estimated between sex and positive urgency and sensation seeking. Indirect effects were tested for the paths between all impulsivity variables and drinking outcomes, through alcohol expectancies.

In model 2, all of the direct and indirect paths tested in model 1 were retained. Lower sensitivity (higher ASQ scores) to the lighter dose/stimulant and heavier dose/sedative effects of alcohol were added as independent variables. Drinking quantity and problems were regressed directly on the two alcohol sensitivity variables. Alcohol sensitivity variables were regressed on sex and covaried with each other.

In model 3, alcohol quantity and problems were regressed on positive and negative expectancies; positive expectancies in turn were regressed on lighter dose/stimulant sensitivity and negative expectancies were regressed on heavier dose/sedative sensitivity. Alcohol sensitivity variables were then regressed on positive urgency, negative urgency, and sensation seeking. Direct paths of alcohol and expectancy variables on impulsivity
variables, paths with sex, and covariances described in models 1 and 2 were retained. Indirect effects were tested for the path between impulsivity variables and positive expectancy via lighter dose/stimulant sensitivity, and for the path from impulsivity variables and negative expectancies via heavier dose/sedative sensitivity. Indirect effects were also tested from lighter dose/stimulant sensitivity to drinking outcomes via positive expectancies, and from heavier dose/sedative sensitivity to drinking outcomes via negative expectancies. Chi square difference test was used to compare model 3 with nested model 2.

Model fit was considered good if the root mean square error of approximation (RMSEA) was less than .06 and both the comparative fit index (CFI) and the Tucker-Lewis index (TLI) were greater than .95 (Hu & Bentler, 1999). Bootstrapping was used to calculate bias-corrected 95% confidence intervals (CIs) for the indirect associations (Muthén & Muthén, 2012).
3 Results

3.1 PCA of the ASQ

Missing data was variable depending on the ASQ item, ranging from 5 individuals with missing data on item 4 to 109 cases missing data for item 12. Since reports of 0, never experiencing the effect, were recoded to missing to prevent inaccurate skewness in the distribution, the large number of individuals with missing data on item 12 suggests that many individuals reported never experiencing the effect (passing out after drinking). The Kaiser-Meyer-Olkin (KMO) test, a measure of the proportion of common variance among variables, verified the sampling adequacy and low communality between variables in the analysis, KMO = .89 (‘marvelous’ according to Hutcheson & Sofroniou, 1999). All KMO values for individual items were greater than .86, which is well above the acceptable limit of .5 (Field, 2013).

The determinant of the correlation matrix was 5.28^{-6}, suggesting an issue with multicollinearity since an acceptable value of the determinant needs to be greater than 1^{-5}. Item 9 (feel that your driving would be affected) had low correlations with other items and communality < .4, indicating it was unrelated to the other items and could be excluded (Costello & Osborne, 2005). Following exclusion of item 9, the determinant of the correlation was 1.73^{-5}, which is greater than the 1^{-5} value required to proceed. The sample size remained adequate (KMO = .90). Parallel analysis obtained two significant components to be extracted. Items 7 (sluggish) and 10 (sedated or sleepy) had cross-loadings > .3, therefore they were removed from the components.

PCA determined that the two components in the final analysis explained 72.8% of the variance. Table 1 shows the pattern matrix of the component loadings after rotation. The item clustering suggests that component 1 represents the lighter dose, mostly stimulant
effects of alcohol and component 2 represents the heavier dose, sedative effects of alcohol. This classification of lighter and heavier dose effects is similar to results of a factor analysis of the ASQ by Fleming and colleagues (2016). Both subscales of the ASQ had high reliabilities, with coefficient alphas of .90 and .94 for the lighter and heavier sedative dose effects, respectively.

Table 1. Pattern matrix of the revised Alcohol Sensitivity Questionnaire

<table>
<thead>
<tr>
<th>Items</th>
<th>Component Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2. More talkative</td>
<td>.85</td>
</tr>
<tr>
<td>3. More flirtatious</td>
<td>.79</td>
</tr>
<tr>
<td>4. High or “buzzed”</td>
<td>.76</td>
</tr>
<tr>
<td>5. More socially at ease</td>
<td>.91</td>
</tr>
<tr>
<td>6. More relaxed</td>
<td>.82</td>
</tr>
<tr>
<td>8. Less inhibited</td>
<td>.60</td>
</tr>
<tr>
<td>11. Experience a hangover. Feel shaky or have a headache the day after drinking</td>
<td>.16</td>
</tr>
<tr>
<td>12. Pass out</td>
<td>-.03</td>
</tr>
<tr>
<td>13. Throw up (vomit)</td>
<td>-.07</td>
</tr>
<tr>
<td>14. Nauseated</td>
<td>0</td>
</tr>
<tr>
<td>15. Forget a part of the evening (i.e., blackouts)</td>
<td>-.03</td>
</tr>
<tr>
<td>16. Feel dizzy or feel things spinning</td>
<td>.05</td>
</tr>
</tbody>
</table>

Extraction method: Principal Component Analysis.
Rotation method: Oblimin.
Rotation converged in 8 iterations.
Item 1 was excluded from component analyses: Have you ever felt any effect after drinking alcohol?
Items 2-10: What is the minimum number of standard drinks after which the effect is noticed?
Items 11-16: What is the maximum number of drinks that could be consumed before noticing the effect?

3.2 Models

All variables in the models reasonably approximated univariate normal distributions (skewness ≤ 1.19 and kurtosis ≤ 1.97), with the exception of the alcohol problems variable. One outlier was identified and subsequently recoded to one unit greater than the next highest value to reduce its influence (Tabachnick & Fidell, 2007). Following outlier
adjustment, the alcohol problems variable met assumptions of univariate normal distribution. Data was retained for the six participants with missing information on the ASQ heavier dose/sedative scale using maximum likelihood estimation.

Table 2 shows the means, standard deviations, and bivariate correlations among all variables in the model. Considering the significant associations between sex and positive urgency and sensation seeking, these two impulsivity variables were covaried with sex in all three models to improve model fit.

Table 2. Means, standard deviations, and correlations among variables in the model

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.93 .60</td>
<td>.68** 1</td>
<td>.18** .03 1</td>
<td>-.04 0 .03 1</td>
<td>-.03 -.05 -.08 .48** 1</td>
<td>.22** .02 -.10 1</td>
<td>.36** .45** .05 .05 0 .40** 1</td>
<td>.43** .48** .09 -.10 -.22** .29** .42** .28** 1</td>
<td>-.17** .05 -.29** -.29** -.42** -.07 .03 -.32** -.09</td>
<td></td>
</tr>
</tbody>
</table>

*a Possible range is 1-4. **Higher ASQ scores indicate lower sensitivity. b Possible range is 1-4. c Average number of drinks per drinking day from the Timeline Followback. d Rutgers Alcohol Problem Index total score; possible range is 0-88. e ASQ-Light: Sensitivity to the lighter dose/stimulant effects of alcohol. ASQ-Heavy: Sensitivity to the heavier dose/sedative effects of alcohol. *p < .05; **p < .01

3.2.1 Model 1: Traditional APM

The hypothesized traditional APM provided a good fit to the data $\chi^2(4) = 3.96, p = .41$; RMSEA = 0, TLI = 1.00, CFI = 1.00. Higher sensation seeking was significantly associated with greater positive expectancies, and higher negative urgency was associated with greater negative expectancies. There were no other significant relationships between impulsivity and expectancies. Both positive and negative
expectancies were associated with greater drinking problems. Positive alcohol expectancies was also associated with greater drinking quantity. There was a significant indirect path from sensation seeking to drinking quantity via positive expectancies. Likewise, the indirect association between negative urgency and drinking problems via negative expectancies was significant. All indirect paths are shown in Table 3. There were also significant direct associations between negative and positive urgency and drinking problems. For clarity, only the significant paths are shown in Figure 4, but all paths were retained in the model.

Figure 4. Path model 1 of the associations between impulsive traits, alcohol expectancies, and alcohol outcomes. Standardized estimates are shown. Significant indirect effects are shown as standardized estimates with bias-corrected 95% confidence intervals in parentheses. *p<.05; **p<.01; ***p<.001
3.2.2 Model 2: APM + ASQ

Model 2, with the addition of ASQ variables, provided a good fit to the data \( \chi^2(14) = 16.42, p = .29, \) RMSEA = .02, TLI = .99, CFI = 1.00. Lower sensitivity to the lighter dose/stimulant effects of alcohol was significantly associated with greater drinking quantity; lower sensitivity to the heavier dose/sedative effects of alcohol was significantly related to greater drinking quantity and problems. Almost all significant paths from model 1 were maintained, with the exception of the associations between positive urgency and positive expectancies with drinking problems. Additionally, there was only one significant indirect association, from negative urgency to drinking problems via negative expectancies. Figure 5 demonstrates the results of model 2, with only significant paths shown for clarity. Indirect effects are shown in Table 4.

Figure 5. Path model 2 with the addition of alcohol sensitivity as independent variables with direct paths to drinking outcomes. Standardized estimates are shown. Significant indirect effects are shown as standardized estimated with bias-corrected 95% confidence intervals in parentheses. * \( p<.05 \); ** \( p<.01 \); *** \( p<.001 \)
3.2.3 Model 3: APM with ASQ

Model 3 provided good fit to the data, $\chi^2(6) = 7.00$, $p = .32$, RMSEA = .02, TLI = .99, CFI = 1.00, but was not significantly different from the nested model 2, $\Delta \chi^2(8) = 9.42$, $p > .05$. Alcohol sensitivity was not related to impulsivity traits or alcohol expectancies and therefore all of the indirect paths in model 3 were non-significant (Table 5). The significant paths shown in model 2 were all retained (see Figure 6). Since model 2 has fewer parameters and fits the data equally well, the parameters added in model 3 can be eliminated and model 2 can be accepted.

Figure 6. Path model 3 tested the relationship between alcohol sensitivity and impulsivity and expectancies in the context of the APM. Standardized estimates are shown. There were no significant indirect effects. Only significant paths are shown for clarity. *p<.05; **p<.01; ***p<.001
Table 3. Model 1: Estimates of indirect effects

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Predictor</th>
<th>Intervening variable</th>
<th>Est.</th>
<th>[95% CI]</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking quantity</td>
<td>Positive urgency</td>
<td>Positive expectancies</td>
<td>.02</td>
<td>[-.01, .07]</td>
<td>.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative expectancies</td>
<td>-.01</td>
<td>[-.05, .01]</td>
<td>.42</td>
</tr>
<tr>
<td></td>
<td>Negative urgency</td>
<td>Positive expectancies</td>
<td>.03</td>
<td>[.01, .08]</td>
<td>.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative expectancies</td>
<td>-.05</td>
<td>[-.12, 0]</td>
<td>.07</td>
</tr>
<tr>
<td></td>
<td>Sensation seeking</td>
<td>Positive expectancies</td>
<td>.03</td>
<td>*[.01, .08]</td>
<td>.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative expectancies</td>
<td>-.007</td>
<td>[-.04, .01]</td>
<td>.54</td>
</tr>
</tbody>
</table>

Table 4. Model 2: Estimates of indirect effects

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Predictor</th>
<th>Intervening variable</th>
<th>Est.</th>
<th>[95% CI]</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking quantity</td>
<td>Positive urgency</td>
<td>Positive expectancies</td>
<td>.01</td>
<td>[.0, .04]</td>
<td>.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative expectancies</td>
<td>.02</td>
<td>[-.01, .05]</td>
<td>.30</td>
</tr>
<tr>
<td></td>
<td>Negative urgency</td>
<td>Positive expectancies</td>
<td>.02</td>
<td>[.0, .05]</td>
<td>.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Negative expectancies</td>
<td>.08</td>
<td>*[.04, .15]</td>
<td>.004</td>
</tr>
</tbody>
</table>

Table 5. Model 3: Estimates of indirect effects

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Predictor</th>
<th>Intervening variable</th>
<th>Est.</th>
<th>[95% CI]</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive expectancies</td>
<td>Positive urgency</td>
<td>Sensitivity to lighter</td>
<td>.001</td>
<td>[.01, .02]</td>
<td>.90</td>
</tr>
<tr>
<td></td>
<td>Negative urgency</td>
<td>dose/stimulant effects</td>
<td>0</td>
<td>[.02, .01]</td>
<td>.92</td>
</tr>
<tr>
<td></td>
<td>Sensation seeking</td>
<td>Sensitivity to lighter</td>
<td>0</td>
<td>[.01, .01]</td>
<td>.95</td>
</tr>
<tr>
<td>Negative expectancies</td>
<td>Positive urgency</td>
<td>dose/stimulant effects</td>
<td>.001</td>
<td>[.01, .02]</td>
<td>.82</td>
</tr>
<tr>
<td></td>
<td>Negative urgency</td>
<td>Sensitivity to lighter</td>
<td>-.004</td>
<td>[.03, 0]</td>
<td>.52</td>
</tr>
<tr>
<td></td>
<td>Sensation seeking</td>
<td>Sensitivity to lighter</td>
<td>-.01</td>
<td>[.03, 0]</td>
<td>.33</td>
</tr>
<tr>
<td>Drinking quantity</td>
<td>ASQ-Light</td>
<td>Positive expectancies</td>
<td>.001</td>
<td>[.02, .02]</td>
<td>.88</td>
</tr>
<tr>
<td></td>
<td>ASQ-Heavy</td>
<td>Negative expectancies</td>
<td>.01</td>
<td>[.03]</td>
<td>.38</td>
</tr>
<tr>
<td>Drinking problems</td>
<td>ASQ-Light</td>
<td>Positive expectancies</td>
<td>.001</td>
<td>[.01, .01]</td>
<td>.88</td>
</tr>
<tr>
<td></td>
<td>ASQ-Heavy</td>
<td>Negative expectancies</td>
<td>-.01</td>
<td>[.04, .01]</td>
<td>.24</td>
</tr>
</tbody>
</table>

Bootstrapping was used to derive bias-corrected 95% confidence intervals (CIs). Est. = estimate. *95% CI does not contain zero.
4 Discussion

The present study was one of the first to examine the role of self-reported sensitivity to alcohol effects in the context of the APM. While some of the indirect effects of alcohol expectancies on the relationships between impulsivity and drinking outcomes were replicated, alcohol sensitivity was found to be unrelated to impulsivity or expectancies in the model. These findings suggest that alcohol sensitivity has an independent, direct effect on drinking outcomes that is not implicated in the learning mechanisms of drinking that comprise the APM.

4.1 Subscales of the ASQ

Two subscales of the ASQ that represented lighter dose, mostly stimulant effects and heavier dose, sedative effects of alcohol were confirmed using PCA. Two items – feeling sluggish and sedated – were excluded from the scales for cross-loading and a third item (driving would be affected after drinking) was excluded for low communality. The lighter dose subscale was comprised of both stimulant and sedative effects (e.g., feeling high, talkative, relaxed, less inhibited) that may be considered to be more positive and rewarding, whereas the heavier dose subscale contained items characteristic of sedative – and perhaps more aversive – effects of alcohol (e.g., hangover, vomiting, blackouts, dizziness). Apart from the exclusion of items, the two components replicated the intended subscales of the ASQ (Fleming et al., 2016).

4.2 Traditional APM

A test of the traditional APM demonstrated good fit to the data. Both positive and negative urgency were directly associated with drinking problems, consistent with studies that drinking to regulate emotions can lead to alcohol problems independent from alcohol consumption levels (Cyders et al., 2007; Merril & Read, 2010, Wardell, Quilty,
Positive alcohol expectancies were significantly associated with sensation seeking and drinking quantity and problems, and negative expectancies were positively related to negative urgency and drinking problems. Correlations between positive and negative expectancies may indicate that heavier drinkers are more likely to experience both positive and negative effects of alcohol.

There was an indirect effect of sensation seeking on drinking quantity through positive expectancies. This path is consistent with other studies of the APM, such as those by Corbin and colleagues (2011, 2015), whereby a combined measure of impulsivity and sensation seeking had an effect on alcohol consumption through positive expectancies. Among a sample of Asian Americans, positive expectancies was an intervening variable in the relationship between the UPPS measure of sensation seeking and alcohol consumption, although there were no indirect effects of expectancies among the Caucasian group (Han & Short, 2009).

Despite the hypothesized inverse relationship between negative expectancies and drinking problems, the association between these two variables in the positive direction has also been demonstrated in several studies. Negative alcohol expectancies of cognitive impairment and aggression were positively associated with alcohol-related problems among individuals aged 18-24 years, but inversely related to alcohol consumption and problems among individuals aged 25 and older (Pabst et al., 2014). Mixed results for negative alcohol expectancies were also found among 298 female college students in Argentina; compared to moderate drinkers, heavy drinkers exhibited higher expectancies of negative mood from alcohol and lower expectancies of risk and aggression (Pilatti, Cupani, & Pautassi, 2015). Furthermore, in biweekly assessments of alcohol use and related consequences during the first year of college, Barnett et al.
(2014) determined that greater drinking quantity was associated with increased likelihood of reported negative versus positive consequences of drinking. The current study found a significant indirect effect of negative expectancies on the relationship between negative urgency and drinking problems. Of the two studies that used the UPPS-P measure of impulsivity to test the APM, one did not examine negative expectancies (Settles et al., 2010), and the other found no mediating effects of positive or negative expectancies between impulsivity and drinking among the Caucasian sample (Han & Short, 2009).

In a validation study of the positive urgency subscale of the UPPS-P, negative expectancies of alcohol such as danger and egotistical self-perception were associated with drinking problems among individuals with high positive urgency, but had no interaction with negative urgency (Cyders et al., 2007). The authors theorized that the urge to act impulsively in response to positive moods was associated with a celebratory loss of control that could result in dangerous behaviours, but loss of control leading to negative expectancies may also be implicated in the urge to drink as a result of negative moods.

In a sample of 300 individuals with either DSM-IV alcohol dependence, alcohol dependence + conduct disorder, or healthy controls, negative same-day alcohol expectancies were associated with greater drinking quantity among the high impulsive group, derived from a median split of the impulsivity self-report measure (Finn, Bobova, Wehner, Fargo, & Rickert, 2005). This data supports the theory that negative expectancies are associated with greater drinking because heavier drinkers are more impulsive and therefore do not inhibit their drinking despite knowing the negative consequences. Future research should try to elucidate the relationship between negative
urgency, negative expectancies and drinking problems by comparing mediation and
moderation models using longitudinal data.

4.3 Addition of alcohol sensitivity to the APM

There was good data fit for the model in which alcohol sensitivity was added to the
overall APM. However, there was no significant difference between the nested model in
which sensitivity to the lighter dose/stimulant and heavier dose/sedative effects were
independent compared to intervening variables between impulsivity and expectancy. The
findings did not support the hypothesis that the relationship between impulsivity
measures and learned expectancies of alcohol would be accounted for by the indirect
effects of alcohol sensitivity. In fact, alcohol sensitivity was unrelated to impulsivity and
expectancies.

Although Scott and Corbin (2014) demonstrated significant associations between self-
reported sensation seeking and stimulant response to both alcohol and placebo (a
measure of positive expectancy), the lack of interaction between sensation seeking and
beverage condition suggested that anticipatory cognitive processes may explain alcohol
expectancies irrespective of pharmacological effects (Hendershot & Wardell, 2014).

Despite research that demonstrates a relationship between impulsivity and stimulant
response to alcohol in the lab, there are several studies using self-report methods that
support the current study’s null findings. In a recent study by Berey and colleagues
(2017), self-reported sensitivity to the stimulant response from alcohol was not related to
self-reported impulsivity, but there was an inverse association between impulsivity and
sensitivity to the sedative effects of alcohol. However, a single item was used to
determine stimulant response, and sedative effects were measured with the SRE.
In a longitudinal study of relatives of individuals with alcohol dependence, SRE level of response to alcohol was weakly related to self-reported impulsivity among 18 year olds at baseline, and did not interact with impulsivity to predict alcohol problems at four-year follow-up, measured by endorsement of criterion for DSM-IV alcohol abuse and dependence in the past two years (Schuckit et al., 2017). In Schuckit et al. (2017) and the present study, lower sensitivity to the sedative effects of alcohol was directly related to alcohol problems and was not directly associated with alcohol expectancies. The current study also found lower sensitivity to the lighter dose/stimulant and heavier dose/sedative responses to alcohol to be associated with greater average alcohol consumption per drinking day. These findings suggest that requiring a greater number of drinks to experience both the positive and negative effects of alcohol may increase drinking quantity, but that lower sensitivity to the more aversive, sedative effects (e.g., hangover, blackouts, vomiting) play a more important role in drinking problems.

Results regarding alcohol consumption are contrary to the modified DM, which posits that heavier drinkers are likely to be more sensitive to the rewarding, stimulant effects and less sensitive to the aversive, sedative effects of alcohol (King et al. 2011). However, there are several measurement differences that may provide explanation for the discrepancy in findings between the current study and research using lab alcohol administration procedures. While the present study used the ASQ at a single time point of retrospective self-report, King and colleagues (2011) employed a lab alcohol administration procedure whereby the Biphasic Alcohol Effects Scale (BAES) (Martin, Earleywine, Musty, Perrine, & Swift, 1993) collected information about rewarding, stimulant and aversive, sedative responses through repeated measurement during the ascending and descending limb and alcohol elimination phase of the BAC. The BAES
was also used in many of the lab alcohol administration studies in which there were significant associations between impulsivity variables and stimulant response (Erblich & Earleywine, 2003; Leeman et al., 2014). Furthermore, research supporting the DM has found higher stimulation responses to alcohol among heavy versus lighter drinkers, a control group that was not present in the current study (King et al., 2011; Thomas, Drobes, Voronin, & Anton, 2004).

4.4 Limitations

The use of cross-sectional data to examine indirect associations limits the interpretation of findings by preventing an understanding of temporal sequencing. Future research should test the ability of this model to be replicated with longitudinal data in order to elucidate the indirect effect of negative expectancies on the relationship between negative urgency and drinking problems. The age group of the participants also limits interpretation of results to other studies that have examined young adults or college samples. Furthermore, the use of self-report, retrospective methodology to collect data about alcohol sensitivity limits the comparison of null findings for the relationship between sensitivity and impulsivity and expectancy variables with lab alcohol administration studies that have mixed results on the associations of impulsivity with alcohol sensitivity.

5 Conclusions

This study was one of the first to investigate the role of self-reported sensitivity to alcohol in the context of the APM. Among the sample of young adult heavy drinkers, alcohol sensitivity had no influence on the acquisition of learned beliefs about the effects of alcohol. Low level of response to the full range of effects of alcohol was directly
associated with greater drinking and problems. Future research should continue to use comprehensive measures of multi-dimensional impulsivity traits, the full range of effects of alcohol, both positive and negative expectancies, and drinking quantity and problems to provide a greater understanding of the development of risky drinking.
6 References


Cyders, M. A., Smith, G. T., Spillane, N. S., Fischer, S., Annus, A. M., & Peterson, C. (2007). Integration of impulsivity and positive mood to predict risky behavior:
Development and validation of a measure of positive urgency. *Psychological Assessment, 19*(1), 107-118.


