The Economics of Alcohol Consumption: Exploring the Relationship between Sensitivity to the Price of Alcohol and Behavioral Consequences

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A common method of controlling alcohol consumption at the population level is the imposition of sin taxes, which are additional taxes on "sinful" consumer goods like cigarettes and alcohol. Despite evidence that individuals who are insensitive to increases in the price of alcohol are more likely to be heavier drinkers, little research attention has been given to understanding this relationship. The current study was designed (1) to evaluate the psychometric properties of a measure of price sensitivity, (2) to explore the relationships among price sensitivity, alcohol use and the experience of alcohol-related problems, and constructs related to alcohol use including alcohol expectancies and drinking motives, and (3) to examine alcohol expectancies and drinking motives as potential mediators of the relationship between price insensitivity and alcohol use/problems. The results suggest that both alcohol expectancies and drinking motives partially mediate the relationship between price insensitivity to alcohol and drinking/problems. Because insensitivity to price is related to increased consumption of alcohol, these findings may have important implications for government taxation policy, suggesting that rather than solely focusing on price, interventions may benefit from addressing people's ideas about what happens when they drink and their motives for drinking.

INTRODUCTION

Alcohol consumption is prevalent in the United States and across the globe, with over two billion people worldwide reporting use (WHO, 2007). While there is evidence to suggest that consuming alcohol in moderation is not harmful (Ashley, Ferrence, Room, & Single, 1994), excessive drinking, including heavy drinking (averaging > 1 drink per day for women or > 2 drinks for men) and binge drinking (consuming at least four drinks in a single sitting for women and five drinks for men), has been linked to serious health problems (e.g., liver cirrhosis, cancer), automobile and other accidents, and death (Centers for Disease Control, 2008). Ultimately, excessive alcohol use is the fifth most common cause of death in the world (World Health Organization, 2007) and is responsible for nearly 80,000 deaths each year in the United States alone (CDC, 2008). Despite the numerous negative consequences associated with excessive drinking, there is a prevalent perception of personal immunity from experiencing negative alcohol-related outcomes (e.g., Hansen, Raynor, & Wolkenstein, 1991).

Neither binge drinking nor heavy drinking is a rare occurrence. Recent surveys report that over 50% of American adults drank alcohol in the past 30 days, with 5.2% engaging in heavy drinking and 15.8% engaging in binge drinking (CDC, 2008). The prevalence of excessive drinking is even higher among young drinkers; over 40% of college students binge drink (Wechsler, Dowdall, Maenner, Gledhill-Hoyt, & Lee, 1998). When taken in concert, the widespread use of alcohol, the plethora of detrimental outcomes, and the sense of personal invulnerability to the negative consequences of consumption make excessive alcohol use a particularly challenging public health problem. As such, there are numerous national and international organizations (e.g., the CDC and the WHO) dedicated to exploring methods by which alcohol consumption can be controlled.

While many interventions designed to decrease alcohol consumption have been proposed and implemented, there has been strong and consistent support for the effectiveness of increasing the price of alcohol, typically achieved through taxation, as a large scale intervention to modulate alcohol use (CDC, 2009; Guide to Community, 2006). In the United States, the imposition of "sin taxes" on goods or services that are not illegal but are commonly viewed in society as vices (e.g., alcohol and cigarettes; Grossman, Sindelar, Mullahy, & Anderson, 1993) is a common practice with a lengthy history. For example, cigarettes have been taxed since the Civil War, and as early as 1791, a tax was levied on whiskey in an effort to decrease alcohol consumption and increase government revenue (Altman, 2009).

By targeting the vices of a subsector of the population, sin taxes represent, for many, an easier and more "justifiable" way to bring in government revenue than angering the population at large through raising costs like income taxes. Thus, there has been speculation that economic motives may be at least as much a part of the attraction to sin taxes as public health concerns (Newman, 2003; Newman, 2010).

Irrespective of the true intent of sin taxes, research supports the notion that increasing taxes on alcohol does contribute to decreased alcohol consumption. A recent meta-analysis of over one hundred studies provided evidence for significant inverse relationships between price and consumption of beer ($r = -.17$), wine ($r = -.30$), and liquor ($r = -.29$; Wagenaar, Salois, & Komro, 2009). When the analyses were limited to a smaller subset of studies that only included heavy drinkers, the effect became negligible ($r = -.01$; Wagenaar et al., 2009). The results of the meta-analysis suggested that, at an aggregate (population) level, increasing alcohol price is one strategy that might be used to curtail drinking. However, the relationship between relative price insensitivity and heavy drinking suggested that, as an intervention, sin taxes may be least effective for those who are at greatest risk for negative alcohol consequences. Despite the importance of this finding, no explanations were offered for the relative insensitivity to alcohol price among heavy drinkers.

Deconstructing the relationship between insensitivity to increases in alcoholic beverage price and heavy drinking is a complex task, in part because the relationship represents a complicated marriage of psychology and economics. However, recent advances in applied behavioral economics may be particularly well-suited to helping psychologists address this relationship. Using a behavioral economics approach, Hursh (2000) found that the relative reinforcing value of alcohol can be determined through the cost an individual is willing to incur to consume alcoholic beverages. Although possible, assessing individuals′ willingness to purchase alcoholic beverages at increasing costs proved quite difficult in real-world contexts. Fortunately, a series of studies conducted by Hursh and colleagues suggested that the amount of alcohol individuals are actually willing to consume is strongly related to the amount that they report being willing to consume when provided with a hypothetical drinking scenario (mean $r^2 = .84$; Hursh, 2000; Hursh, Raslear, Shurtleff, Bauman, & Simmons, 1998).

Having provided a sound rationale for circumventing the difficulties of assessing individuals' alcohol utility in real-world contexts, Hursh and colleagues paved the way for the development of the Alcohol Purchase Task (APT; Murphy & MacKillop, 2006). The APT assesses individuals' hypothetical willingness to purchase alcohol across a range of increasing prices. Respondents are asked to imagine a situation in which they are at a bar and must purchase any and all alcoholic beverages they intend to drink for the night. They are then asked to indicate how many drinks they would be willing to purchase across a range of increasing prices (e.g., $0.00 [free] to $9.00). Mirroring the results of the meta-analysis, studies that have assessed the relationship between price sensitivity and drinking status (i.e., heavy versus light) using the APT have shown that heavier drinkers are less sensitive to increases in price than lighter drinkers (Murphy & MacKillop 2006; Murphy & MacKillop 2007;

MacKillop et al., 2009; Wagenaar et al., 2009). Although the relationship between price insensitivity and heavier drinking has been replicated across several studies, no study to date has attempted to explain why heavy drinkers are relatively insensitive to changes in the cost of alcohol. As an important first step toward understanding this relationship, the current study examined how the APT might be related to constructs known to relate to drinking, such as alcohol expectancies and motives for drinking.

Alcohol expectancies are "if-then statements about alcohol effects that can be interpreted as a cognitive representation of one's past direct and/or indirect experiences with alcohol" (Leigh, 1999) and are typically categorized as either positive (e.g., happy, talkative) or negative (e.g., depressed, sick). Numerous studies have suggested that alcohol outcome expectancies are associated with alcohol use, usually highlighting a relationship between drinking behavior and the expectation that consuming alcohol will result in positive outcomes (e.g., Brown, Goldman, & Christiansen, 1985; Carey, 1995). However, holding beliefs that negative consequences are unlikely to result from drinking alcohol may also increase the risk for heavy drinking (e.g., Grube & Agostinelli, 1999). Differences in expectancies have been noted across gender, drinker status, and age, with younger males and heavier drinkers reporting more positive expectancies and fewer negative ones (Carey, 1995). In sum, evidence suggests that individuals with more positive (and possibly less negative) alcohol expectancies are more likely than individuals with more negative (and less positive) expectancies to be heavy drinkers.

Drinking motives, presumed to be more proximal to actual alcohol consumption than alcohol expectancies, have also been shown to impact alcohol consumption (Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007). People drink to achieve certain outcomes (Cox & Klinger, 1988), and they engage in different drinking behaviors depending on what motivates their alcohol use (Cutter & O'Farrell, 1984). Blackwell & Conrod (2003) identified five primary reasons why individuals drink: for social interaction, to enhance experience, to cope with anxiety, to cope with depression, and to conform to the drinking practices of others. Grant, Stewart, and Mohr (2009) found that enhancement and coping motives are positively related to typical quantity and frequency of alcohol use and heavy drinking, social motives are positively related to frequency and quantity of alcohol consumption but not to heavy drinking, and conformity motives are negatively associated with the quantity and frequency of alcohol use and heavy drinking, but positively related to drinking problems.

Expanding upon previous research, the current study examined the relationship between the APT, alcohol expectancies, drinking motives, alcohol consumption or use (for the purposes of the current study, this is defined as quantity of drinks consumed divided by frequency of consumption), and the experience of alcohol-related problems. Also unique to this study was the inclusion of disposable income as a covariate in all analyses, because increased spending money was expected to be related to an increased willingness (via ability) to spend money on alcohol. Since it could be the case that individuals who are wealthier overall are willing to spend more money on drinks independ-

ent of their drinker status, connections established by prior work between variables of interest (e.g., expectancies, motives, consumption, etc.) may be misleading. The APT, alcohol expectancies, and drinking motives were expected to relate to one another and to both alcohol use and the experience of alcohol-related problems. Specifically, price insensitivity was expected to predict heavier alcohol use and increased alcohol-related problems. Important to establishing the utility of the APT and price sensitivity as a construct, scores on this measure were expected to evidence incremental validity in predicting alcohol use and the experience of alcohol-related problems, above and beyond that accounted for by alcohol expectancies and drinking motives. Considering that alcohol expectancies and drinking motives are related to heavy alcohol use and that insensitivity to the price of alcohol is related to heavy drinking, it may be that price insensitivity translates to heavy drinking, in part, through the expectations and motives individuals have. Therefore, preliminary analyses examined alcohol expectancies and drinking motives as potential mediators of the relationship between alcohol purchase price and alcohol use as well as the relationship between purchase price and alcohol-related problems. Individuals who reported an increased willingness to buy alcohol even at high prices were expected to be heavier drinkers and to experience more alcohol-related problems as a result of having positive expectancies and/or drinking for social, enhancement, and/or coping reasons.

THE PRESENT STUDY

Methods

Procedure
Upon arriving at the laboratory, all participants provided consent before completing an hour-long survey. The survey was comprised of a demographics questionnaire (i.e., sex, age, and spending money) and a series of additional measures designed to assess participants' engagement in a range of health-related behaviors including alcohol consumption, drug use, and eating and gambling behaviors. Participants were compensated $10.00 for their time. All procedures were approved by Yale University's Institutional Review Board.

Participants
The sample consisted of 210 participants who reported drinking at least one time in the past three months (90 males and 117 females; three people did not report a sex). Participants were recruited from Yale University and the broader New Haven community. The sample was diverse with respect to race/ethnicity: 48.9% of the participants were Caucasian, 23.8% were Asian or Asian-American, 10.2% were African American, 6% were Hispanic/Latino, and 11.1% reported being biracial or identified as "other." The mean age of the sample was 23.94 years (SD = 7.39; range 18-61). When asked to report on their drinking habits over the past three months, participants reported drinking an average of 3.93 drinks (SD = 2.86) on 2.31 days per week (SD = 1.68). The average maximum number of drinks participants reported consuming during a single drinking episode was 7.34 drinks (SD = 4.33). Participants' average monthly disposable

income ranged from $200 to $299 per month.

Measures

Alcohol Purchase Task (APT; Murphy & MacKillop, 2006). The APT is a self-report measure designed to assess participants' willingness to purchase alcoholic beverages at increasing prices. Participants are given a hypothetical situation in which they are at a bar and must purchase any and all alcoholic beverages they intend to drink for the night. While the original version of the measure assessed 14 price points ranging from $0.00 to $9.00, given the high price of alcoholic beverages in New England, the current study employed a modified version of the APT in which twenty price points were assessed, ranging from $0.00 to $15.00. From these data, the APT generates five subscales. "Intensity of demand," shortened in the current study to "intensity," represents the number of drinks an individual would consume if each drink were free. Intensity serves as a baseline indicator of drinking behaviors. "Breakpoint" represents the first price point at which consumption drops to zero (i.e., the first price point at which the participant declines to purchase alcohol). "Output Maximum," shortened to "OMAX," represents the number of drinks at which point an individuals' financial expenditure on alcohol is at its peak. "Price Maximum," or "PMAX," is the price at which expenditure is maximized. In other words, PMAX is the price point that corresponds to OMAX. Finally, "elasticity of demand," represents individuals' sensitivity to increases in the cost of alcohol. The overall elasticity of demand is the mean of each individual's price elasticity curve. Typically, each of the subscales is evaluated as an independent predictor of alcohol-related outcomes or factor analysis is used to create two factors representing price (elasticity, PMAX, and breakpoint) and consumption (intensity and OMAX). However, given the extremely strong relationships between price and consumption factor scores in the current study, performance on the APT was quantified with a single APT factor score, representing general willingness to purchase alcohol at increasing prices.

Brief Comprehensive Effects of Alcohol questionnaire (BCEOA; Ham, Stewart, Norton, & Hope, 2005). The BCEOA is a 15-item self-report measure that assesses individuals' positive and negative alcohol expectancies. It comprises four subscales: Liquid Courage (e.g., feeling brave and daring), Change in Self-Perception (e.g., feeling guilty or moody), Sexual Experiences (e.g., feeling like a better lover or enjoying sex more), and Tension Reduction (e.g., feeling peaceful or calm). Participants rate the likelihood of experiencing each of the possible alcohol effects using a five-point Likert scale that ranges from "Disagree" to "Agree." While shorter than its parent measure (the CEOA), the BCEOA has demonstrated comparable psychometric properties to the CEOA.

Modified Drinking Motives Questionnaire Revised (MDMQR; Blackwell & Conrod, 2003). The MDMQR is a self-report measure designed to assess individuals' motivations for consuming alcohol. Using a five-point Likert scale ranging from one (almost never/never) to five (almost always/always), participants are asked to indicate how often they drink for 28 different reasons. The MDMQR is based on the Drinking Motives Questionnaire Revised (DMQR; Cooper, 1994), which described a four-factor model of drinking motives. Adding to the predic-

tive validity of its parent measure (the Drinking Motives Questionnaire Revised, Cooper, 1994), the MDMQR differentiates between anxiety-related coping and depression-related coping motives (Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007). In total, the modified questionnaire includes five motives: improvement of social interactions (e.g., because it is what most of my friends do when we get together), enhancement of experience (e.g., because it makes me feel good), coping with anxiety (e.g., to reduce my anxiety), coping with depression (e.g., to stop me from feeling so hopeless about the future), and conforming to the drinking practices of others (e.g., to fit in with a group I like). Social, enhancement, and coping (anxiety and depression) motives have consistently been associated with alcohol consumption, while conformity and coping have been shown to be related to the experience of drinking-related problems (e.g., Grant, Stewart, & Mohr, 2009).

Results

Overview of statistical analyses
Given concerns about multicollinearity, the APT variables were ultimately combined into a single APT factor, representing willingness to purchase alcohol at increasing prices. Next, a series of analyses were conducted to evaluate the convergent, predictive, and incremental validity of the APT. The convergent validity of the APT with alcohol expectancies, drinking motives, alcohol use, and the experience of alcohol-related problems was evaluated using bivariate correlations. Sex and spending money were significantly related to the APT, so they were included as covariates in all remaining analyses. Separate multiple regression models evaluated the predictive validity of the APT with re-

spect to alcohol expectancies, drinking motives, alcohol use, and the experience of alcohol-related problems. Completing the validity analyses, the incremental validity of the APT was evaluated with respect to alcohol use and the experience of alcohol-related problems, controlling for the effects of alternative measures of alcohol expectancies and drinking motives.

After the basic validity of the single APT factor was evaluated, alcohol expectancies and drinking motives were examined as possible mediators of the relationships between the APT and drinking and alcohol-related problems, respectively. Mediation was tested following the procedures outlined by Baron and Kenny (1986).

Creating an APT factor
Each of the APT subscales—intensity, breakpoint, PMAX, OMAX, and elasticity—proved to be significantly correlated with the others, and in some cases the correlations raised serious concerns about multicollinearity (e.g., PMAX and breakpoint were correlated at greater than .80). Past research provided a precedent for reducing the APT variables into two factors, reflecting price ("persistence," which was composed of elasticity, PMAX, and breakpoint) and consumption ("amplitude," which was composed of Intensity and OMAX; MacKillop et al., 2009). However, the relationship between the price and consumption factors in the current study was extremely strong—several of the APT variables loaded onto both factors—and a two factor model was unable to converge. Given the correlations among the APT subscales, a factor analytic model was specified to create a single APT factor from the original subscales, which represented individuals' general willingness to consume

drinks at increasing prices. Each of the original subscales loaded positively and significantly onto the composite APT factor (α = .71). The APT factor was used in all further analyses.

Determining covariates
Bivariate correlations were used to determine which variables should be included as covariates in the regression models assessing the relationships between the APT and the relevant measures. It was expected that gender and spending money would be significant covariates. As anticipated, moderate correlations were found between the APT and participant sex (male or female, with males being more likely to consume more alcohol at higher prices; $r = -.30$, $p < .001$) and between the APT and participant spending money ($r = .30$, $p < .001$). Consequently, in all analyses, participant sex and disposable income (i.e., spending money— participants averaged approximately $250 per month) were used as covariates. To assess how much variance in participants' APT scores was accounted for by the covariates, the covariates were entered into a regression model predicting a person's APT score. Sex accounted for 8.7% ($p < .001$) of the variance in APT scores and spending money accounted for 8.4% ($p < .001$).

Establishing the convergent validity of the APT
Based on previous research, alcohol expectancies and drinking motives were expected to be strongly associated with consumption of alcohol and with the experience of alcohol-related problems. Given past evidence of a relationship between APT scores and drinking, APT scores were also expected to be strongly associated with alcohol consumption, expectancies, and motives. Extending previous research, the current study also examined the relationship between APT scores and alcohol-related problems; moderate correlations between the constructs were expected.

To test these hypotheses, bivariate correlations between the APT and alcohol expectancies, drinking motives, alcohol consumption (i.e., a composite score representing typical quantity of alcohol consumed by typical frequency of consumption), and the experience of alcohol-related problems were examined (see Tables 1 & 2). A strong correlation ($r = .58$, $p < .001$) was found between the APT and alcohol consumption. Moderate correlations were found between the APT and social interaction motives ($r = .36$, $p < .001$), coping with anxiety motives ($r = .32$, $p < .001$), enhancement of experience motives ($r = .40$, $p < .001$), and experience of alcohol-related problems ($r = .31$ $p < .001$). Small positive correlations were found between the APT and social enhancement expectancies ($r = .17$, $p = .011$), sex-related expectancies ($r = .26$, $p < .001$), tension-reduction expectancies ($r = .16$, $p = .014$), and coping with depression motives ($r = .26$, $p < .001$).

Establishing the predictive validity of the APT
In general, the bivariate correlations provided preliminary evidence that the APT was related to alcohol use, the experience of alcohol-related problems, alcohol expectancies, and drinking motives. Therefore, a series of univariate and multivariate regression models were used to examine the predictive validity of the APT with respect to these constructs. It was expected that the APT would account for significant variance in both alcohol use and alcohol-related problems.

Multiple regression models suggested that the APT was a significant predictor of alcohol consumption ($\eta p^2 = .13$, $p < .001$) and the experience of alcohol-related problems, although the effect was small ($\eta p^2 = .02$, $p = .015$), and after controlling for typical drinking, the APT no longer predicted alcohol-related problems.

Multivariate regression models were used to evaluate the ability of the APT to predict alcohol expectancies and drinking motives because each dependent variable was comprised of several subscales (see Table 2). There was a significant main effect of the APT on alcohol expectancies as measured by the CEOA ($\eta p^2 = .09$, $p < .001$). With respect to the specific expectancies subscales, the APT accounted for significant variance in social ($\eta p^2 = .03$, $p = .017$), sexual ($\eta p^2 = .07$, $p < .001$), and tension reduction ($\eta p^2 = .03$, $p = .011$) expectancies. A univariate regression model was used to examine the relationship between the APT and the single positive expectancy factor. As expected, the APT predicted positive alcohol expectancies ($\eta p^2 = .07$, $p < .001$). In regards to the Drinking Motives Questionnaire, the APT accounted for significant variance in drinking motives as assessed by the MDMQR ($\eta p^2 = .16$, $p < .001$). With respect to the subscales, the APT accounted for significant variance in social ($\eta p^2 = .09$, $p < .001$) and enhancement ($\eta p^2 = .14$, $p < .001$) motives as well as drinking to cope with anxiety ($\eta p^2 = .09$, $p < .001$) and depression ($\eta p^2 = .06$, $p < .01$).

Establishing the incremental validity of the APT

Given preliminary evidence of convergent and predictive validity, the incremental validity of the APT was evaluated to determine if it accounted for significant variance in alcohol use and problems above and beyond existing measures known to relate to these outcomes (i.e., expectancies and motives). For the model assessing alcohol use, the APT was entered simultaneously with the covariates, the four expectancy subscales, and the five drinking motives subscales. The APT predicted drinking above and beyond expectancies and motives ($\eta p^2 = .13$, $p < .001$). While the magnitude of the effect was much smaller, the APT also predicted the experience of alcohol-related problems ($\eta p^2 = .02$, $p = .015$). However, when typical alcohol use was controlled for, the APT composite variable no longer predicted problems above and beyond expectancies and motives. This suggests that the effects of APT scores on problems operating through levels of consumption are primarily indirect.

Testing the APT as a mediator of alcohol consumption and problems

Through the process of evaluating the validity of the APT, we found that it was related to positive expectancies and to drinking motives, and that it accounted for unique variance in alcohol use and problems above and beyond these constructs. Given our interest in further understanding the relationships between the APT and alcohol use, and the APT and problems, we assessed whether these could be understood, at least in part, as a function of individuals' alcohol expectancies and/or drinking motives. Using hierarchical multiple regression, we first examined whether alcohol expectancies and/or drinking motives mediated the relationship between the APT and alcohol consumption. We then checked whether expectancies and/or motives mediated the relationship between the APT and the experience of alco-

hol-related problems. Our hypothesis was that expectancies and drinking motives would mediate both of these relationships. The following steps designed by Baron and Kenny (1986) were used to test for mediation:

Step 1: Show that the independent variable (the APT) predicts the outcome (consumption of alcohol or experience of alcohol related problems). To establish the potential for mediation, run a regression model with the APT and the outcome variables.

Step 2: Show that the APT predicts the mediator (expectancies or motives for drinking). Test the ability of the APT to predict expectancies or motives by running a regression model with the mediators as the outcome variables[*].

Step 3: Show that the mediators predict the outcome variable(s) when controlling for the APT. If expectancies and motives completely mediate the relationships between the APT and alcohol consumption or between the APT and drinking problems, the effect of the APT on the outcome variables when controlling for expectancies/motives would be zero.

Step 4: If full mediation is not present, there is still the potential for partial mediation. Partial mediation can be tested for using the Sobel test to evaluate whether there is a sig-

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[*] Both steps 1 and 2 were evaluated within the predictive validity analysis (see Tables 1 and 2). The results of Step 2 are presented in the following section as a reminder of which subscales were significant. However, to prevent repetition, results from Step 1 are not presented again.

nificant indirect effect. In this case, there may be a significant indirect effect of APT scores on drinking through alcohol expectancies.

Alcohol Use

Expectancies as mediators of the relationship between the APT and weekly drinking

Step 2: A significant relationship between the APT and alcohol expectancies was established (see Table 1). The APT predicted sex, social, and tension reduction alcohol expectancies. Because these three subscales constitute the positive side of alcohol expectancies, they were grouped together and are hereafter referred to as "positive expectancies."

Step 3: Positive expectancies were significantly related to alcohol consumption when controlling for the APT ($\eta p^2 = .046$, $p = .01$; see Table 2 and Figure 1 for more detail). As the effect of the APT on the outcome variables was not zero, expectancies did not fully mediate the relationship between APT scores and drinking.

Step 4: To evaluate whether expectancies served as partial mediators, the Sobel test was used to determine whether the indirect effect was significant. Positive expectancies significantly partially mediated the relationship between the APT and alcohol consumption ($z = 3.068$, $p = .002$; see Figure 1).

Motives as mediators of the relationship between APT and drinking

Step 2: A significant relationship between the APT and drinking motives was established (see Table 1). The APT predicted so-

cial, enhancement, and coping with depression and anxiety motives for drinking. Although some of these subscales were correlated with each other, the correlations were not strong enough to make multicollinearity a concern.

Step 3: Social ($\eta p^2 = .013$, $p = .005$) and enhancement ($\eta p^2 = .017$, $p = .004$) motives, but not coping motives, were significantly related to alcohol consumption when controlling for the APT and other motives (see Table 2 and Figure 2 for more detail). As the

Table 1. Correlations of APT with alcohol use, problems, expectancies, and motives.

Alcohol Use and the Experience of Alcohol-Related Problems			
Alcohol Use .575**			Problems .316**
Expectancies			
Self-Perception -.039	Sex .260**	Social .17*	Tension Reduction .163*
Drinking Motives			
Social	Coping with Anxiety	Coping with Depression	Enhancement	Conformity
0.355**	0.321**	0.259**	0.398**	0.109

Note: *p < .05. **p < .001.

Table 2. Predictive and incremental validity of the APT for alcohol use, problems, expectancies, and motives.

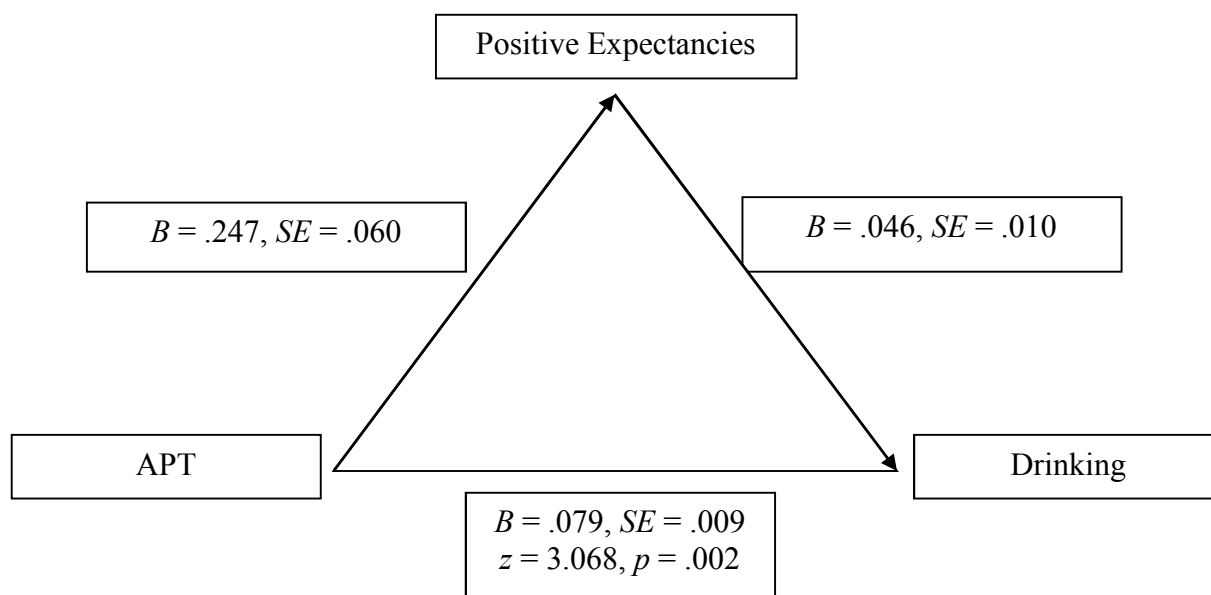| Variable	R^2	B	SE B	β
Alcohol Use	.132**	.079	.009	.538
Problems	.019*	.011	.003	.271
Positive Expectancies	.089*	.247	.060	.294
Drinking Motives				
Social	.090*	.659	.153	.295
Coping (Depression)	.057*	.722	.239	.212
Enhancement	.135*	.958	.170	.384

Note: *p < .05. **p < .001.

Figure 1. Positive expectancies as partial mediators of the relationship between price sensitivity (APT) and alcohol use.

effect of the APT on the outcome variables was not zero, motives did not fully mediate the relationship between APT scores and drinking.

Step 4: To evaluate whether motives served as partial mediators, the Sobel test was used to determine whether any of the indirect effects were significant. Social ($z = 3.14$, $p = .001$) and enhancement ($z = 3.42$, $p < .001$) motives significantly partially mediated the relationship between the APT and consumption of alcohol (see Figure 2).

The Experience of Alcohol-Related Problems

Expectancies as mediators of the relationship between APT and problems

Step 3: Positive expectancies were significantly related to alcohol-related problems when controlling for the APT ($\eta p^2 = .013$, $p = .003$; see Table 2 and Figure 3 for more de-

tail). As the effect of the APT on the outcome variables was not zero, positive expectancies did not fully mediate the relationship between APT scores and problems.

Step 4: To evaluate partial mediation, the Sobel test was used to determine whether the indirect effect was significant. Positive expectancies ($z = 2.98$, $p = .002$) significantly partially mediated the relationship between the APT and experiencing alcohol-related problems (see Figure 3).

Motives as mediators of the relationship between APT and problems

Step 2: A significant relationship between the APT and drinking motives was established (see Table 1). The APT predicted social, enhancement, and coping with depression and anxiety motives for drinking.
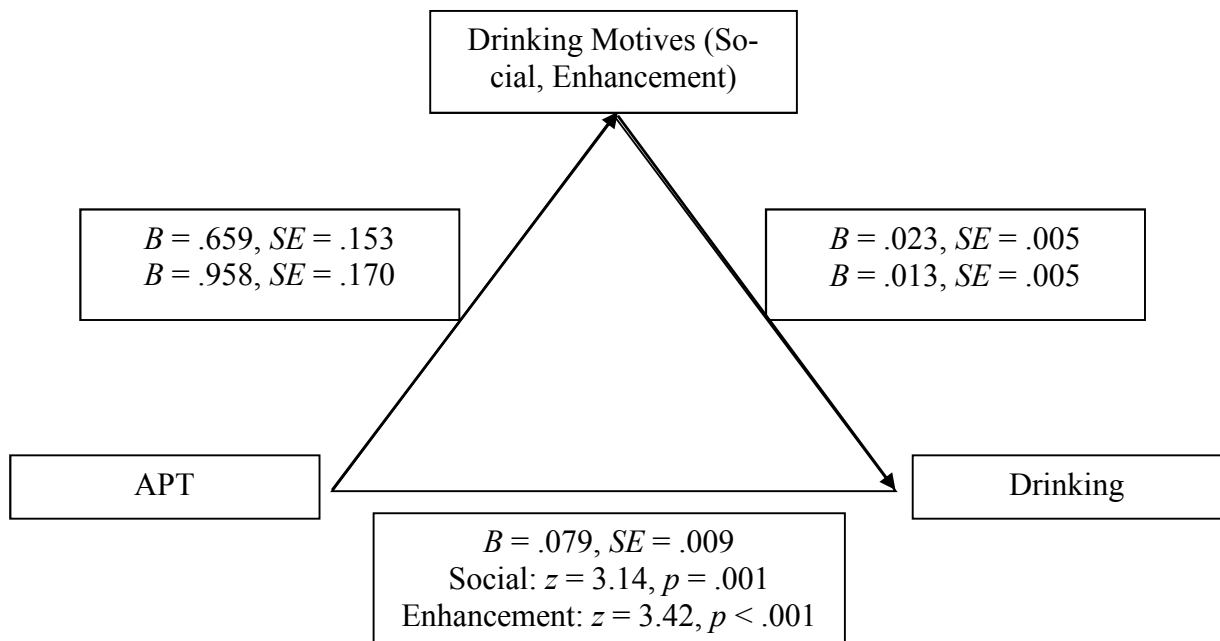
Figure 2. Drinking motives as partial mediators of the relationship between price sensitivity (APT) and alcohol use.

Step 3: Drinking to cope with depression motives was significantly related to alcohol-related problems when controlling for the APT and other motives (ηp^2 = .004, p = .001; see Table 2 and Figure 4 for more detail). As the effect of the APT on the outcome variables was not zero, motives did not fully mediate the relationship between APT scores and problems.

Step 4: To evaluate partial mediation, the Sobel test was used to determine whether the indirect effect was significant. Coping with depression (z = 2.41, p = .015) significantly partially mediated the relationship between the APT and experiencing alcohol-related problems (see Figure 4).

DISCUSSION

The APT is a relatively new measure, and there is a paucity of research examining its psychometric properties. The current study was the first to extend analyses of the con-

vergent, predictive, and incremental validity of the APT. As anticipated, the APT was significantly related to alcohol expectancies and drinking motives, two constructs that have been consistently identified as important predictors of drinking behavior. The strength of the correlations indicated that these constructs are related to one another but that they are also distinct. Improving upon previous research, the current study was the first to evaluate the relationship between the APT and spending money. Results indicated a moderate positive relationship between these constructs, such that as disposable income increased, so did participants' general willingness to purchase drinks at higher prices. Although it was not possible to assess why the relationship between spending money and the APT existed, a plausible explanation may be that individuals with more money might be willing to incur higher drink prices simply because they can afford to. Therefore, the results of previous studies could have been driven by a
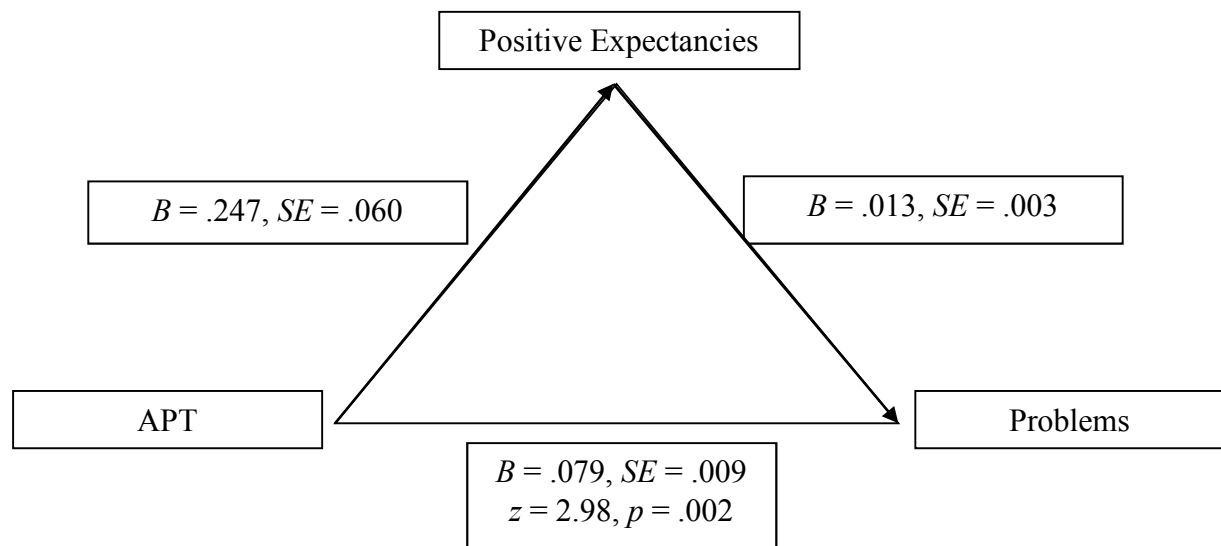
Figure 3. Positive expectancies as partial mediators of the relationship between price sensitivity (APT) and the experience of alcohol-related problems.
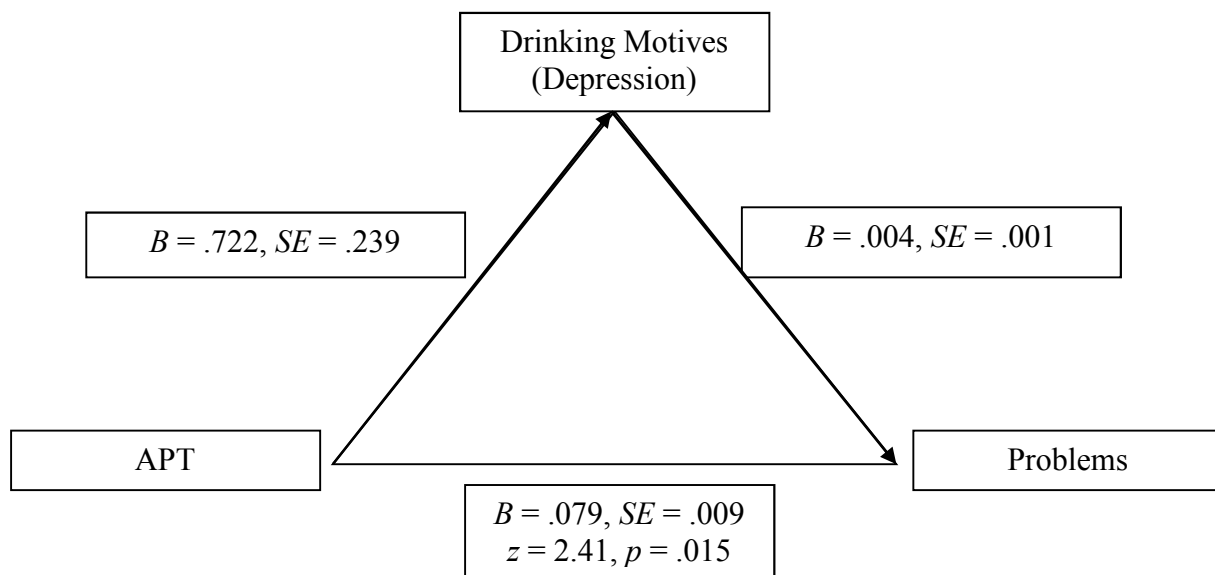
The figure shows boxes labeled "Positive Expectancies" at top, "APT" at bottom left, and "Problems" at bottom right, connected with the following values:

- $B = .247, SE = .060$
- $B = .013, SE = .003$
- $B = .079, SE = .009$
- $z = 2.98, p = .002$

Figure 4. Drinking motives as partial mediators of the relationship between price sensitivity (APT) and the experience of alcohol-related problems.

The figure shows boxes labeled "Drinking Motives (Depression)" at top, "APT" at bottom left, and "Problems" at bottom right, connected with the following values:

- $B = .722, SE = .239$
- $B = .004, SE = .001$
- $B = .079, SE = .009$
- $z = 2.41, p = .015$

combination of price sensitivity and individuals' disposable income. The current study was the first to take disposable income into account to help isolate price insensitivity.

Even after controlling for gender and spending money, the APT accounted for significant variance in alcohol consumption and drinking-related problems. Furthermore, after controlling for alcohol expectancies and motives for drinking, the APT demonstrated incremental validity in accounting for consumption and problems. In sum, the results provide support for the value of the APT as a measure of an individual's willingness to consume alcohol at different price points.

Given that the APT, alcohol expectancies, and drinking motives each predicted alcohol consumption and the experience of alcohol-related problems, the current study examined whether and how these constructs may work in concert in predicting alcohol outcomes. Prior to the current study, this issue had not yet been addressed; previous studies had shown individuals who are more insensitive to the price of alcohol are more likely to be heavier drinkers, but steps have not yet been taken to explain this pattern. Given that there is a strong relationship between alcohol expectancies/motives for drinking and alcohol consumption, the current study formulated a model examining whether insensitivity to price contributes to drinking through these constructs. In other words, we hypothesized that the APT might affect consumption of alcohol and problems through expectancies and motives. The preliminary tests of mediation suggested this may be the case, but because the data are cross-sectional, future work is necessary before any kind of definitive answer can be reached.

The current study provided preliminary evidence for the convergent, predictive, and incremental validity of the APT. Furthermore, it made an important initial attempt at deconstructing the relationship between price insensitivity and alcohol use documented by earlier studies (Wagenaar et al., 2009). Despite these key strengths, the study has several limitations that should be considered. Previous studies either examined each of the APT subscales independently or created two factors representing price and consumption. Within the current study, the APT subscales evidenced significant overlap with one another, making it difficult to distinguish between them. In addition, the problems with multicollinearity among the subscales made it impossible to replicate the two factors used in previous papers. As such, the current study collapsed the APT subscales into a single factor representing a composite of willingness to purchase alcohol at increasing prices. Unfortunately, using the composite APT score made it impossible to assess the independent contributions of the APT subscales. Additionally, the study's inability to examine each subscale individually within the model may have contributed to the fact that many of the effect sizes had smaller magnitudes than expected, a second important limitation. It could be that the effect of a subscale that might have accounted for a moderate amount of variance when taken by itself was masked in the process of being combined with other, less important subscales. Alternatively, these small effects could reflect the true magnitude of the associations between the APT and other alcohol-related variables.

A third limitation of the current study was that all of the data came from self-report measures. Although the accuracy of

self-report data has been questioned, self-report measures have generally been shown to be reliable when it comes to assessing alcohol consumption and its consequences (Babor, Steinberg, Anton, & Del Boca, 2000).

Finally, it is important to acknowledge that all of the data within the current study were cross-sectional, representing only a snapshot of participants' experience. As such, it was impossible to assess relationships among variables across time, prohibiting conclusions about the directionality of effects (i.e., causality). While the current study suggested that insensitivity to price may translate to heavier drinking through positive expectancies and motives, it is also possible that a heavy drinker may be so motivated to consume alcohol as a result of developing positive expectancies over time that he or she is willing to incur higher costs for the reward of drinking. A third possibility is that price insensitivity leads to heavy drinking, which leads to more positive expectancies and stronger motives for drinking. Longitudinal data is needed to flesh out the temporal relationships among these constructs.

Despite the limitations, the current study suggested that price sensitivity is a construct worthy of further investigation. The preliminary mediation analyses indicated that price insensitivity may operate through expectancies and motives to influence consumption of alcohol and the experience of problems. In addition, this study demonstrated for the first time that spending money and gender must be taken into account when examining price sensitivity to alcohol consumption. Future research will benefit from including these important covariates.

On a broader level, the results of the current study may have implications for alcohol tax policies and for alcohol interventions. The study suggests that the relationship between price insensitivity and heavy drinking identified in previous research may be due, at least in part, to the amount of spending money individuals have and to the kinds of alcohol expectancies and drinking motives they hold. Replicating the results of this study would lend strength to the idea that large-scale interventions designed to temper alcohol consumption, like sin taxes, may only be effective for certain subgroups of the population. This is not to say that sin taxes are completely ineffective, or that they should be eradicated. Rather, when choosing an intervention designed to target those for whom drinking causes the most problems (i.e., heavy drinkers), attempting to control price may only be an effective intervention in concert with targeting expectations and motivations for alcohol use.

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