Perceived Local Enforcement, Personal Beliefs, and Underage Drinking: An Assessment of Moderating and Main Effects*

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ABSTRACT. Objective: Strategies to enforce underage drinking laws are aimed at reducing youth access to alcohol from commercial and social sources and deterring its possession and use. However, the processes through which enforcement strategies may affect underage drinking are not well understood. This study examined three possible processes by which perceived enforcement of underage drinking laws and personal beliefs (perceived alcohol availability, perceived harm, and personal disapproval of alcohol use) may influence alcohol use among adolescents. **Method:** Survey data were obtained from 20,747 adolescents (48.3% males) in 115 school districts who participated in the 2006 Oregon Healthy Teens survey. Linear regression analyses were conducted to examine possible interactive and main effects of perceived enforcement and personal beliefs on past-30-day alcohol use. Analyses were adjusted

for clustering of observations within school districts and included student demographics and age of alcohol use initiation as covariates. **Results:** Statistically significant interaction effects on past-30-day alcohol use were found for perceived police enforcement and the three personal beliefs variables, indicating weaker associations between personal beliefs and past-30-day alcohol use at higher levels of perceived enforcement. Main effects of perceived enforcement and personal beliefs variables were also observed in the presence of interaction effects. **Conclusions:** Evidence for a moderating effect of perceived local enforcement on the relationships between personal beliefs and drinking behaviors suggests that the combination of individually focused prevention programs and local enforcement of underage drinking laws may have the greatest impact on underage drinking. (*J. Stud. Alcohol Drugs* 70: 64-69, 2009)

DESPITE THE NATIONAL 21-year-old minimum legal drinking age, alcohol continues to be the most commonly used drug among adolescents (Bonnie and O'Connell, 2004). Data from the 2006 Monitoring the Future survey show that 17%, 34%, and 45% of 8th, 10th, and 12th graders, respectively, reported alcohol use in the past 30 days, and 11%, 22%, and 25% reported having five or more drinks in a row in the past 2 weeks (Johnston et al., 2007). The 2006 Monitoring the Future survey also found that 92.5% of 12th graders, 83.1% of 10th graders, and 63.0% of 8th graders thought that it was "fairly easy" or "very easy" to get alcohol (Johnston et al., 2007).

Research indicates that adolescents obtain alcoholic beverages from a wide range of commercial and social sources (e.g., Dent et al., 2005; Paschall et al., 2007; Wagenaar et al., 1996). Thus, it is important to address both of these sources in prevention efforts. Enforcement strategies aimed at reducing commercial alcohol availability include compliance checks, cops-in-shops, and related programs that focus on deterring sales of alcohol to youth or discouraging youth from attempting to buy alcohol. Enforcement strategies to

reduce social alcohol availability include party dispersal programs, increased enforcement of alcohol possession and consumption laws, and implementation of social host ordinances. Such enforcement strategies may directly reduce underage access to alcohol, resulting in a reduction in consumption and related problems.

Enforcement strategies may also affect underage use of alcohol sources and drinking behaviors indirectly through their effects on adolescents' beliefs about the availability of alcohol, the risks of alcohol use, and the social acceptability of drinking. Numerous studies have demonstrated that such beliefs are predictive of alcohol use and heavy episodic drinking (Bersamin et al., 2005; Beyers et al., 2004; Hawkins et al., 1992; Nation and Heflinger, 2006). Based on deterrence theory (Bishai et al., 2005; Nagin, 1998), which posits that individuals will not engage in delinquent or criminal behavior if they expect a swift, certain, and severe penalty for the behavior, minor-in-possession or other minimum-legal-drinking-age enforcement strategies may affect alcohol-related behaviors indirectly through their effects on these beliefs. Enforcement activities may also increase the social and legal costs of obtaining and drinking alcohol as perceived by adolescents, thus acting as a deterrent.

It is also possible that actual or perceived enforcement strategies may moderate the effects of personal beliefs on drinking behavior (Dent et al., 2005; Weitzman et al., 2005). For example, youth who do not believe that alcohol use is harmful may be less likely to obtain and drink alcohol if they also perceive a high likelihood of getting caught by

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local police. Similarly, youth who believe alcohol is easy to obtain or do not think it is wrong to drink alcohol may be less likely to engage in alcohol use if they also perceive a high likelihood of getting caught by local police.

Figure 1 depicts possible processes through which perceived local enforcement of minor-in-possession or other minimum-legal-drinking-age laws and personal beliefs may affect alcohol use. The first model in Figure 1 suggests that perceived enforcement is related to underage drinking indirectly through the adolescents' personal beliefs (i.e., personal beliefs mediate enforcement effects). In this case, higher levels of perceived enforcement are hypothesized to lead to beliefs that are less supportive of drinking and, as a result, to a lower likelihood and level of alcohol consumption. In the second model, perceived enforcement is hypothesized to have a moderating effect on relationships between personal beliefs and drinking behaviors. We hypothesized that greater perceived local enforcement of minor-in-possession or minimum-legal-drinking-age laws would attenuate the effects of personal beliefs on alcohol use. Finally, perceived local enforcement and personal beliefs could have main effects on drinking behaviors that might be qualified by their interactive effects. The purpose of the current study is to evaluate these competing models with respect to a latent measure of past-30-day alcohol use, with the understanding that observation of interaction effects would preclude investigation of mediational effects (Baron and Kenny, 1986; James and Brett, 1984; MacKinnon, 2007).

Method

Study sample and survey method

This study is based on a sample of 20,747 middle and high school students (primarily 8th and 11th graders) in 115 Oregon school districts who participated in the 2006 Oregon Healthy Teens (OHT) survey and who provided complete data for all study variables. The OHT survey was administered in schools that were part of a statewide random OHT sample, a Centers for Disease Control and Prevention Youth Risk Behavior Surveillance System survey sample, or schools that wished to participate voluntarily. Surveys were administered by Oregon Research Institute staff or trained teachers to students in their classrooms and took one class period to complete. Survey data were collected anonymously, and institutional review board approval for analysis of the OHT data was obtained before implementation of the study. The overall OHT response rate was 81.2%. Sample characteristics are provided in Table 1.

Measures

Alcohol-related behaviors. Participants were asked about their frequency of alcohol use in the past 30 days (five possible responses ranged from "0 occasions" to "10 or more occasions"), having five or more drinks in a row (seven possible responses ranged from "0 days" to "20 or more days"),

FIGURE 1. Illustration of mediator and moderator effects

TABLE 1. Sample characteristics, percentage or mean (SD) ($N = 20,747$)

Variable	% or mean (SD)
Gender	
Male	48.3%
Female	51.7%
Race/ethnicity	
White	80.8%
Nonwhite	19.2%
Age, in years	
12-14	51.7%
15-16	18.9%
17-18	29.5%
Alcohol-related behaviors ^a	
Initiation of alcohol use before age 12	20.9%
Frequency of alcohol use, past 30 days	1.39 (2.50)
Frequency of heavy episodic drinking, past 30 days	0.71 (2.23)
Frequency of drinking alcohol at a party, past 30 days	0.83 (2.60)
Personal beliefs	
Perceived alcohol availability	2.97 (1.12)
Perceived harm of alcohol use	2.80 (0.99)
Personal disapproval of alcohol use	3.06 (0.99)
Perceived police enforcement	2.32 (0.84)

^aA single past-30-day alcohol use factor score (mean [SD] = 0 [1]) was derived from the three past-30-day frequency measures.

and drinking alcohol at a party (seven possible responses ranged from “0 days” to “20 or more days”). Factor analysis yielded a single-factor solution, accounting for 81% of the variance (factor loadings range: .88-.92). Therefore, a latent factor score, representing past-30-day alcohol use (mean [SD] = 0 [1]), served as the dependent variable for this study.

Students were also asked how old they were the first time they had more than just a sip or two of an alcoholic beverage (e.g., beer, wine, distilled spirits). This variable was dichotomized to indicate whether each respondent had initiated alcohol use before age 12 years.

Demographics. Students reported their gender, race/ethnicity, and age. Race/ethnicity was treated as a dichotomous variable (white vs nonwhite) because the majority of respondents were white.

Personal beliefs. Personal beliefs included perceived alcohol availability, perceived harm of alcohol use, and personal disapproval of alcohol use. To assess perceived alcohol availability, adolescents were asked, “If you wanted to get some beer, wine, or hard liquor (for example, vodka, whiskey, or gin), how easy would it be for you to get some?”, with a 4-point response scale ranging from “very hard” to “very easy”. Perceived harm was measured by the question, “How much do you think people risk harming themselves (physically or in other ways) if they take one or two drinks of an alcoholic beverage nearly every day?”, with a 4-point response scale from “no risk” to “great risk.” Personal disapproval was assessed by the question, “How wrong do you think it is for someone your age to drink beer, wine, or hard liquor regularly?”, with a 4-point response scale from “not wrong at all” to “very wrong.” The correlations between these items were moderate in strength ($r = -.15-.37$);

therefore we treated them as separate measures of personal beliefs.

Perceived local enforcement. Two items served as measures for perceived local enforcement: (1) “If someone your age drank some beer, wine or hard liquor in your neighborhood, he or she would be caught by the police,” and (2) “If there were a party in your neighborhood where people your age were drinking, the police would come and break it up.” Response options were on a 4-point scale ranging from “not at all true” to “very much true.” A fairly high correlation was found between these two items ($r = .54$); therefore, the mean of these two variables was computed to represent a general enforcement measure.

Data analysis

We used linear regression analyses to evaluate the models specified in Figure 1. Analyses were conducted with HLM Version 6.04 software to adjust for clustering of observations within school districts (Raudenbush et al., 2004). The intraclass correlation coefficient for past-30-day alcohol use was modest (.007). All models included school district-level random effect for past-30-day alcohol use (intercept). Participants’ gender, race, age, and alcohol use before age 12 years were included as control variables. Analytical steps used to evaluate the models specified in Figure 1 are described in the following.

Results

Following the approach described by MacKinnon et al. (2007), we first investigated possible interaction effects between personal beliefs and perceived local enforcement on past-30-day alcohol use. Personal beliefs and perceived local enforcement variables were centered to minimize multicollinearity between interaction terms and main effects in regression models. As indicated in Table 2, statistically significant interaction effects on past-30-day alcohol use were found for perceived police enforcement and the three personal beliefs variables. In addition, in the presence of these interaction terms and the background covariates, significant main effects of perceived police enforcement and the three personal beliefs variables on past-30-day alcohol use were in the expected directions. Perceived police enforcement, perceived harm of alcohol use, and personal disapproval of alcohol use were inversely associated with past-30-day alcohol use, whereas perceived alcohol availability was positively associated with past-30-day alcohol use. Taking into account the cross-sectional nature of the current study, these significant interactions precluded assessment of mediational models (MacKinnon et al., 2007).

The nature of the interactions between personal beliefs and perceived local enforcement on past-30-day alcohol use is summarized in Table 3, which shows beta coefficients (95% confidence intervals) for relationships between

TABLE 2. Results of regression analysis to assess interactive effects of perceived police enforcement and personal beliefs on past-30-day underage drinking, beta coefficient (SE)

Predictors	Past-30-day alcohol use
Male	-.03 (.012)*
White	-.03 (.016)*
Age	.05 (.004)†
Alcohol use before age 12 years	.28 (.016)†
Perceived alcohol availability	.07 (.007)†
Perceived harm of alcohol use	-.05 (.007)†
Personal disapproval of alcohol use	-.33 (.007)†
Perceived police enforcement	-.04 (.007)†
Perceived Availability × Perceived Police Enforcement	-.03 (.006)†
Perceived Harm × Perceived Police Enforcement	.03 (.006)†
Personal Disapproval × Perceived Police Enforcement	.07 (.007)†
R ²	.22

* $p < .05$; † $p < .01$.

personal beliefs variables and past-30-day alcohol use by levels (quartiles) of perceived police enforcement. The interactions are also illustrated in Figures 2, 3, and 4, which show plots of adjusted mean values for past-30-day alcohol use for each level of perceived availability of alcohol (Figure 2), perceived harm of alcohol use (Figure 3), and personal disapproval of alcohol use (Figure 4) by quartiles of perceived police enforcement (very low, low, moderate, high). Relationships between personal beliefs variables and past-30-day alcohol use were stronger at lower levels of perceived police enforcement. Comparisons of regression coefficients (Table 3) indicate that the positive association between perceived alcohol availability and past-30-day alcohol use was generally stronger at the lowest level of perceived police enforcement compared with moderate and high levels. For example, the inverse association between personal disapproval of alcohol and past-30-day drinking was significantly stronger at the lowest levels of perceived police enforcement compared with moderate and high levels.

Discussion

This study examined three possible processes by which local police enforcement of underage drinking laws and

FIGURE 2. Perceived police enforcement as a moderator of the relationship between perceived alcohol availability and past-30-day alcohol use

personal beliefs may affect alcohol use among adolescents. Our results suggest that perceived local enforcement may act as a moderator of relationships between personal beliefs and alcohol use, such that personal beliefs are more strongly associated with alcohol use at lower levels of perceived enforcement. Our findings also supported the main effects of these factors in the presence of interaction effects, such that higher levels of perceived enforcement, personal disapproval, and perceived harm were inversely related to alcohol use, whereas perceived ease of obtaining alcohol was positively associated with alcohol use. The observed interaction effects of perceived enforcement precluded assessment of mediating effects of personal beliefs (MacKinnon et al., 2007).

TABLE 3. Beta coefficient (95% confidence interval) for relationship between each personal beliefs variable and past-30-day alcohol use, by level (quartile) of perceived police enforcement

Perceived police enforcement	Perceived alcohol availability	Perceived harm of alcohol use	Personal disapproval of alcohol use
Very low (1)	.10 (.07-.14)†	-.09 (-.12--.06)†	-.39 (-.42--.36)†
Low (2)	.09 (.06-.11)†	-.06 (-.09--.03)†	-.38 (-.41--.35)†
Moderate (3)	.05 (.03-.07)†	-.05 (-.08--.02)†	-.30 (-.33--.27)†
High (4)	.05 (.04-.07)†	-.01 (-.03-.01)	-.26 (-.28--.24)†
Differences between beta coefficients by enforcement level	1 > 3-4 ($p < .10$)	1 > 4 ($p < .05$) 2 > 4 ($p < .10$)	1-2 > 3-4 ($p < .05$)

† $p < .01$.

FIGURE 3. Perceived police enforcement as a moderator of the relationship between perceived harm of alcohol use and past-30-day alcohol use

Our findings suggest that a higher level of perceived police enforcement may attenuate the effects of personal beliefs on underage drinking. Thus, in the absence of individually focused prevention strategies that attempt to alter adolescents' perception of risks associated with alcohol use and their personal attitudes toward drinking, minor-in-possession and other minimum-legal-drinking-age enforcement activities may be particularly effective in reducing underage drinking. Figures 2, 3, and 4 also suggest possible synergistic effects of perceived enforcement and personal beliefs because the lowest levels of past-30-day alcohol use were observed among youth who had the least favorable attitudes toward alcohol use and the highest levels of perceived enforcement. Thus, the combination of individually focused prevention programs and local enforcement of underage drinking laws may have the greatest impact on underage drinking.

The results of this study should be considered in light of several limitations. The cross-sectional design limits our ability to make causal inferences. Longitudinal data, especially when obtained within a randomized controlled design, can help to establish such relationships. Student self-report measures of perceived police enforcement may not reflect actual levels of enforcement at the community level. It is possible that different conclusions would be drawn from objective measures of community-level enforcement activities (e.g., citations and arrests for underage alcohol possession). Future studies should, therefore, examine whether actual

FIGURE 4. Perceived police enforcement as a moderator of the relationship between personal disapproval of alcohol use and past-30-day alcohol use

enforcement activities are related to perceived enforcement, personal beliefs, youth access to alcohol, and alcohol-related behaviors. Measures of personal beliefs were limited to perceived alcohol availability and perceived harm and personal disapproval of alcohol use. Other types of personal beliefs (e.g., drinking outcome expectancies) may expand our understanding about the processes through which enforcement activities may affect alcohol availability and use among underage youth (Grube and Agostinelli, 1999).

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