Risk Perception, Social Support, and Alcohol Use among U.S. Adolescents

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Abstract

We proposed a conceptual model hypothesizing that, among U.S. adolescents, risk perception and social support are negatively associated with alcohol consumption, and that risk perception mediates the effects on alcohol use of conversation with parents and drug/alcohol education. We tested the model using a national sample of adolescents (N = 19,264) participating in the 2011 National Survey on Drug Use and Health (NSDUH). We found that higher risk perception and social support are associated with lower alcohol consumption; risk perception partially mediates the relationship between conversation with parents and alcohol use, and the relationship between drug/alcohol education and alcohol use; conversation with parents is more effective in increasing risk perception than drug/alcohol education. Study implications were discussed.

Key Words: adolescents, alcohol, risk perception, social support, conversation with parents, drug/alcohol education

Introduction
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Underage drinking is a serious public health problem in the United States. Although recent years have witnessed a decline in alcohol use among U.S. adolescents, there is still an alarming alcohol-consumption rate in this population. According to data from the Monitoring the Future (MTF) study, an annual survey of U.S. youth, 35.3% of 12th graders, 21.5% of 10th graders, and 9.7% of 8th graders had consumed alcohol in the past 30 days before taking the survey in 2015 (University of Michigan, 2015).

Many psychosocial factors have been identified as having the potential to prevent underage drinking. One such protective factor is risk perception of alcohol consumption (Birhanu, Bisetegn, & Woldeyohannes, 2014; Grevenstein, Nagy, & Kroeninger-Jungaberle, 2015). Another important factor that may reduce underage drinking is social support received from adolescents' social networks (Wei, Heckman, Gay, & Weeks, 2011; Wormington, Anderson, Tomlinson, & Brown, 2013). Although effects of risk perception or social support on underage drinking have been examined separately in extant literature, no researcher to date has explored the joint effects of these two factors.

According to social cognitive theory, behavior is the outcome of both cognitive and environmental factors (Bandura, 2001). Thus, one of our three aims in this study is to examine risk perception (a cognitive factor) and social support (an environmental factor) simultaneously. The second aim is to explore the influences of potential information sources (i.e., potential interventions) on risk perception of alcohol consumption among adolescents, as it is unclear which of these sources in adolescents' living environments may be effective at enhancing risk perception of alcohol consumption and reducing actual drinking among adolescents. The third aim is to test whether risk perception could be a theoretical mechanism accounting for the relationships between information sources and alcohol consumption among adolescents. Below we first explain two theoretical frameworks in relation to the current study; then, we summarize findings related to risk perception, social support, and underage drinking; after that, we pose research hypotheses and questions and present a conceptual model for data analyses.

Theoretical Frameworks
Two-step process model

Scholars from different disciplines have proposed different models to explain how intervention variables influence health/risky behaviors. One of these models is the two-step process model, which suggests that intervention variables change individuals' behaviors through a two-step process: in the first step, intervention

variables target a mediating variable (e.g., risk perception) and, ideally, change it; in the second step, the modified mediating variable produces behavioral effects on individuals (Karlsson, 2008). There are two indispensable conditions for this process to succeed: first, the mediating variable must be associated with the behavior; second, intervention variables must be able to influence the mediating variable that is associated with the behavior (Karlsson, 2008).

Relying on the two-step process model, we propose that two information-based intervention variables—interpersonal communication and media intervention about the risks of alcohol consumption—affect drinking behavior through their influences on risk perception. It is beyond the scope of the current paper to include numerous factors in a single investigation. For interpersonal communication, we focus on communication with parents about drug/alcohol risks, as parents often serve as role models in adolescents' lives. For media intervention, we focus on drug/alcohol education that adolescents can potentially receive from school and mass media.

We include conversation with parents about drug/alcohol risks and drug/alcohol education in our study for two reasons. First, our aim is to reveal information sources that protect adolescents from binge drinking. Parental communication about drugs and alcohol (Carver, Elliott, Kennedy, & Hanley, 2017) and drug/alcohol education (Midford et al., 2012) are possible information sources that could discourage or reduce adolescent alcohol use. There is evidence that parents play a powerful role in protecting adolescents from initiating the use of alcohol and other substances (e.g., Murry et al., 2014). Second, family-based intervention programs (Murry et al., 2014) and school-based intervention programs (Midford et al., 2012) have been recommended as applicable strategies to reduce risky behaviors (e.g., binge drinking) among adolescents.

Main-effect model of social support

Social support has been conceptualized from different perspectives: the sociological perspective defines social support as one's level of social integration or embeddedness in his/her social networks, while the psychological perspective defines social support as one's perceived availability of support (Burleson & MacGeorge, 2002; Cohen & Wills, 1985). We aim to examine social support from a communication perspective for two reasons: first, social support is essentially provided, received, or exchanged through communication processes; second, studying social support from a communication perspective has great potential to advance the social support literature (Burleson & MacGeorge, 2002). Thus, we conceptualize

social support as supportive communication that individuals receive from their network members.

The exact mechanism through which social support influences health behaviors or other health outcomes is still being investigated. According to the main-effect model, social support produces a direct beneficial effect on health outcomes, independent of stressors (Cohen & Wills, 1985). The main-effect model has been supported in some recent studies examining the association between social support and critical health outcomes using a communication perspective (e.g., Chen & Bello, 2017; Chen & Feeley, 2014a). Thus, we adopt the main-effect model, speculating that supportive communication received from network members serves as a protective mechanism against alcohol use among adolescents.

Risk Perception and Alcohol Use among Adolescents

Adolescence is a period during which teens are prone to experimenting with risky behaviors (e.g., alcohol use) as they transition to adulthood (McAloney, 2015). Researchers have consistently documented that lower risk perception of negative consequences of alcohol use is associated with greater alcohol consumption among adolescents. For instance, Wetherill and Fromme (2007) reported that, among a sample of high school students in the U.S., perceived risk was negatively associated with drinking frequency and quantity of alcohol consumed. Later on, in a study on teenagers in eight European countries, Miller, Chomcynova, and Beck (2009) found that lower risk perception of cannabis or alcohol use is associated with greater use. Recently, Birhanu et al. (2014) documented that low perceived risk of substance use (including alcohol use) has a positive association with substance use among high school adolescents in Northwest Ethiopia. Similarly, in a longitudinal study with a sample of German youths, Grevenstein et al. (2015) demonstrated there are significant negative effects of alcohol risk perception on alcohol use frequency, suggesting risk perception as a protective factor for adolescent alcohol use. Thus, risk perception remains an important cognitive mechanism determining alcohol consumption in teens. We pose the following hypothesis:

H1: Higher risk perception is associated with less alcohol use.

The Roles of Information Sources in Risk Perception and in Alcohol Use among Adolescents

The formation of risk perception in adolescents should be primarily influenced by their living and working environments (Pilav, Rudić, Branković, & Djido, 2015).

What is not known is how teens' risk perceptions are shaped by various information sources. In particular, it remains unclear which sources of information contribute to adolescents' risk perceptions in relation to alcohol consumption.

One of the possible information sources influencing adolescents' alcohol risk perception and alcohol use is their parents. Strict parental rules on drinking alcohol have been shown to have a protective effect on drinking behaviors in Dutch adolescents (de Looze et al., 2012; Harakeh, de Looze, Schrijvers, van Dorsselaer, & Vollebergh, 2012). Greater parental control and negative parental attitude toward getting drunk were found to be associated with higher risk perception (i.e., beliefs that alcohol harms people) and lower alcohol use among teenagers in Europe (Miller et al., 2009). Additionally, a recent review of the literature shows that parent–child conversations about health risks of substances (e.g., alcohol) predict lower levels of substance use (Carver et al., 2017). These findings suggest that parents serve as an important information source that shapes adolescents' risk perceptions about alcohol use. We speculate that conversations with parents involving alcohol risks will lead to higher risk perception in adolescents, which will subsequently reduce their alcohol consumption. Thus, the following hypothesis and research question are posed:

H2a: More conversation with parents about drug/alcohol risks is associated with higher risk perception.

RQ1a: Does higher risk perception mediate the relationship *between* more conversation with parents about drug/alcohol risks *and* less alcohol use?

In addition to information from parents, adolescents' risk perception may be influenced by drug/alcohol prevention messages they receive from school and mass media. Noar (2006) concluded, through a systematic review of the health campaign literature, that targeted and well-executed health mass media campaigns in general can exert small-to-moderate impacts on health knowledge, beliefs, attitudes, and behaviors. Ayers and Myers (2012) also suggested that anti-drinking media messages can successfully increase people's risk perception. Among studies focusing on adolescents, Lennox and Cecchini (2008) demonstrated that the Narconon drug education curriculum was effective in significantly increasing perceptions of risk and reducing drug use (e.g., alcohol use) at six month follow-up among high school students in Oklahoma and Hawaii. Similarly, Midford et al. (2012) found that Australian students (aged 13 to 15) who received a harm-reduction focused school drug-education program

had more knowledge about drug-use issues, consumed less alcohol, and experienced fewer alcohol-related harms. In terms of the impact of prevention messages outside school, Slater and Jain (2011) reported that adolescents' attention to TV shows about police, crime, or emergency services is related to their increased risk perceptions regarding alcohol-related injuries. In the current study, we aim to explore drug/alcohol education that adolescents receive both inside and outside school, as their risk perception is likely to be influenced by multiple sources of information. It is possible that, among adolescents, receiving more drug/alcohol education is related to higher alcohol-related risk perception which, in turn, predicts less alcohol use. Thus, we pose the following hypothesis and research question:

H2b: More drug/alcohol education is associated with higher risk perception.

RQ1b: Does higher risk perception mediate the relationship *between* more drug/alcohol education *and* less alcohol use?

Social Support and Alcohol Use among Adolescents

According to the main-effect model of social support, social support received from network members can serve as a protective mechanism against alcohol use. The main-effect model has been supported by recent studies involving social support and alcohol use among adolescents. In these studies, social support has been examined using both sociological and psychological perspectives. Using the sociological perspective, Mason (2008) found that adolescents in an urban substance abuse treatment program who engaged in positive activities with their social network members were less likely to use/abuse drugs and alcohol. In another study on adolescents completing residential substance use treatment, Wei et al. (2011) suggested that strengthening adolescents' social integration enhanced their motivation to avoid using drugs and alcohol. Recently, Pilav et al. (2015) recommended strengthening adolescents' social support networks within their living and working environments as a prevention strategy for alcohol/substance use.

Among studies using the psychological perspective of social support, Hamdan-Mansour, Puskar, and Sereika (2007) found that perceived social support from family served as a strong protective factor against alcohol use among rural adolescents in the U.S. Similar findings were also reported by studies conducted among adolescents in Europe. For instance, Tomcikova, Geckova, Orosova, van Dijk, and Reijneveld (2009) reported that, among adolescents in Slovakia, low social support from the family (i.e., low parental support) was

predictive of frequent adolescent drunkenness. These studies suggested that social support from family, especially parents, can be effective in discouraging alcohol consumption among adolescents. Thus, we pose the following hypothesis:

H3a: Higher social support received from parents is associated with less alcohol use.

Adolescence is a period during which teens' reliance on their parents diminishes and they may instead seek support outside the family. Teachers may play an important role in providing adolescents with supportive social relationships . However, there is a paucity of studies on the association between teacher support and adolescents' risky behaviors. Although Donath et al. (2012) found aggressive behavior in teachers to be a risk factor for adolescent binge drinking and recommended "training teachers in positive,

reassuring behavior and constructive criticism" as a viable intervention strategy, they did not specifically examine the role of teacher support in their study (p. 263). To our knowledge, only one study involved social support from teachers and adolescents' alcohol use; in that study, Wormington et al. (2013) suggested that middle school students who perceived high levels of teacher support were less likely to report alcohol use initiation. Thus, we propose to explore social support from teachers together with social support from parents when studying alcohol use among adolescents. The following hypothesis is posed:

H3b: Higher social support received from teachers is associated with less alcohol use.

A hypothesized conceptual model is presented in Figure 1, which depicts the relationships among major variables.
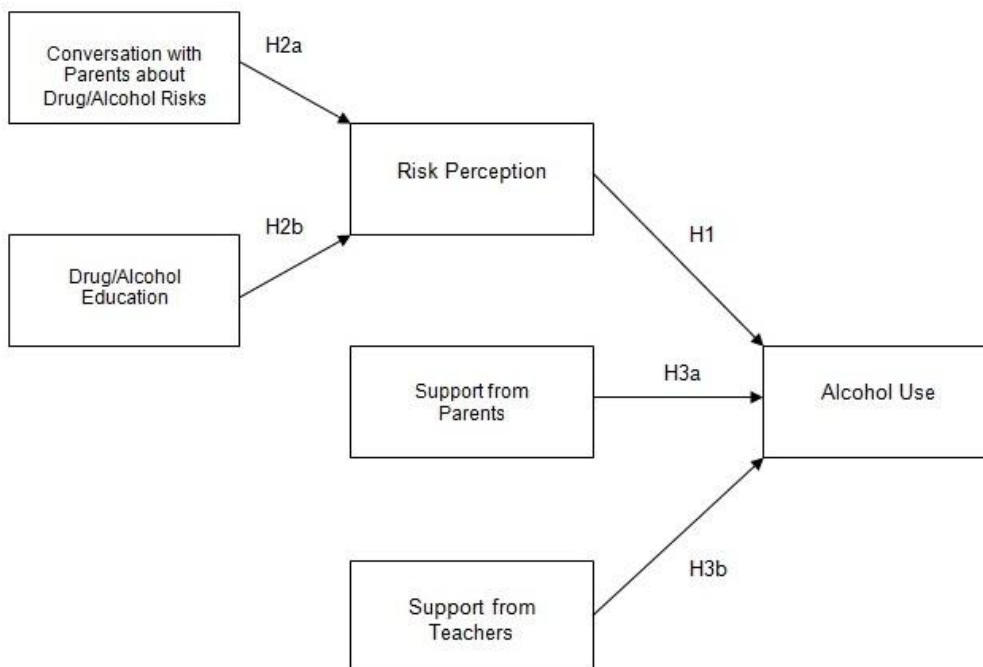

Figure 1 *Hypothesized conceptual model presenting relationships among major variables*

Method

The current investigation relies upon the 2011 National Survey on Drug Use and Health (NSDUH), a nationally representative survey designed to investigate the use of illicit drugs, alcohol, and tobacco among members of United States households aged 12 and older (2011 NSDUH; visit http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/344 81). In the 2011 NSDUH, questions measuring our study

variables were only asked among respondents aged 12 to 17, which is the CDC (2016) definition of adolescence. The final sample weight was applied in all inferential analyses, as advised by the data archive of the 2011 NSDUH.

Participants

Of the 58,397 individuals who completed the 2011 NSDUH, 19,264 answered questions measuring

our study variables, and they were included in the analyses. The ages of these participants ranged from 12 to 17 years (M = 14.57, SD = 1.70) and 9,881 (51.3%) were male. 11,235 of participants were White (58.3%). Eighteen percent of participants had annual family incomes less than $20,000. Participants' self-reported health status ranged from 1 = *Poor* to 5 = *Excellent*, with a mean of 4.06 (SD = .84), indicating that their average health status was very good.

Measures

Conversation with parents about drug/alcohol risks was assessed by one item: "During the past 12 months, have you talked with at least one of your parents about the dangers of alcohol or drug use?" This item had been used in some early national surveys, such as the 2000 National Household Survey on Drug Abuse (NHSDA). The responses for this item were 1 = *Yes* and 2 = *No*. This item was recoded so that 0 = *No* and 1 = *Yes*.

Drug/alcohol education was measured by four items asking participants' experiences of drug/alcohol education during the past 12 months: (1) "Have you had a special class about drugs or alcohol in school?" (2) "Have you had films, lectures, discussions, or printed information about drugs or alcohol in one of your regular school classes such as health or physical education?" (3) "Have you had films, lectures, discussions, or printed information about drugs or alcohol outside of one of your regular classes such as in a special assembly?" (4) "Have you seen or heard any alcohol or drug prevention messages from sources outside school such as posters, pamphlets, radio, or TV?" These four items had been used in the 2000 NHSDA. The responses for these items were 1 = *Yes* and 2 = *No*. Items were recoded so that 0 = *No* and 1 = *Yes*. These four items were summed up to create a measure of drug/alcohol education, and higher values indicate receiving more education.

Risk perception of alcohol use was measured by two items: (1) "How much do people risk harming themselves physically and in other ways when they have four or five drinks of an alcoholic beverage nearly every day?" (2) "How much do people risk harming themselves physically and in other ways when they have five or more drinks of an alcoholic beverage once or twice a week?" These two items represent a general assessment of risk from excessive drinking, and had been used in the 2000 NHSDA. The responses for these items were 1 = *No risk,* 2 = *Slight risk,* 3 = *Moderate risk* and 4 = *Great risk*. Higher values indicate higher risk perception. The reliability was α = .70 for this measure.

Social support from parents was measured by two items asking participants' experiences with their parents during the past 12 months: (1) "How often did your parents let you know when you'd done a good job?" (2) "How often did your parents tell you they were proud of you for something you had done?" These two items provide good face validity of supportive communication from parents and had been used in the 1999 NHSDA. The responses for these items ranged from 1 = *Always*, 2 = *Sometimes,* 3 = *Seldom,* to 4 = *Never*. Items were recoded so that higher values indicate higher social support from parents. The reliability was α = .77 for this measure.

Social support from teachers was measured by one item: "During the past 12 months, how often did your teachers at school let you know when you were doing a good job with you school work?" This item provides good face validity of supportive communication from teachers and had been used in the 1999 NHSDA. The responses for this item ranged from 1 = *Always*, 2 = *Sometimes,* 3 = *Seldom,* to 4 = *Never*. This item was recoded so that higher values indicate higher social support from teachers.

Alcohol use was measured by one item: "In the past 12 months, what is the total number of days that you used alcohol?" The 12-month alcohol consumption was used as the outcome variable, in order to be consistent with the time frames of measures of other variables (e.g., drug/alcohol education).

Control variables. Demographics (age, gender, race, family income, education) and self-reported health status were included as control variables.

Analysis Plan

Two hierarchical multiple regressions were run to test the proposed model. In each regression, demographics and self-reported health status were included as control variables. The first hierarchical regression examined the unique effects of conversation with parents, drug/alcohol education, and risk perception (the mediator) on alcohol use (the outcome variable). This hierarchical regression also examined the separate effects of social support from parents and social support from teachers on alcohol use. The second hierarchical regression examined the unique effects of conversation with parents and drug/alcohol education on risk perception. To examine the mediational questions, the present study used Baron and Kenny's (1986) analytical framework (i.e., four criteria for mediation) combined with the Sobel test (Preacher, 2010). This mediation-testing approach is appropriate when a study has a large sample size (Fritz & MacKinnon, 2007), which is the case in the current study.

Results

Table 1 shows descriptive statistics and a zero-order correlation matrix of major variables in the hypothesized conceptual model. We have three aims in this study including (1) to examine the unique effects of risk perception and social support on alcohol use; (2) to explore the influences of information sources on risk perception; and (3) to test the mediating role of risk perception in the relationships between information sources and alcohol use. We realized these aims by conducting hierarchical regressions and mediation analyses described below.

Model 4 of Table 2 shows that, after controlling for conversation with parents, drug/alcohol education, support from parents, and support from teachers, higher risk perception was associated with less alcohol use (β = -.203, p < .001). Thus, H1 was supported.

Table 1 *Descriptive Statistics and Zero-Order Correlation Matrix of Major Variables (Based on the Unweighted Sample)*

Variable	1	2	3	4	5	6
1. Conversation with Parents about Drug/Alcohol Risks	—	.203**	.076**	.254**	.122**	-.048**
2. Drug/Alcohol Education		—	.078**	.110**	.089**	-.056**
3. Risk Perception			—	.095**	.082**	-.221**
4. Support from Parents				—	.302**	-.103**
5. Support from Teachers					—	-.055**
6. Total Number of Days Using Alcohol in the past 12 months						—
Mean	0.58	2.21	3.33	3.33	3.08	74.52
SD	0.49	1.24	0.68	0.70	0.83	84.78

Note. ** p < . 01.

Table 2 *Hierarchical Regression of Predictors on Total Number of Days Using Alcohol in the Past 12 Months (Based on the Weighted Sample)*

Predictors	Model 1			Model 2			Model 3			Model 4		
	B	*SE*	β	*B*	*SE*	β	*B*	*SE*	β	*B*	*SE*	β
Age	4.259	.034	.106	4.135	.034	.103	3.616	.033	.090	3.449	.033	.086
Gender 1 = Male; 2 =Female	-1.890	.041	-.018	-2.024	.041	-.020	1.553	.041	.015	1.086	.041	.010
Race 1 = White; 2 =Non-White	-4.936	.044	-.046	-5.121	.044	-.048	-2.072	.044	-.019	-1.968	.044	-.019
Family Income	-2.501	.011	-.096	-2.398	.011	-.092	-2.187	.011	-.084	-2.161	.011	-.083
Health	-3.619	.025	-.059	-3.473	.025	-.056	-3.286	.024	-.053	-2.936	.025	-.048
Education	1.231	.031	.033	1.335	.031	.036	1.965	.031	.053	2.004	.031	.054
Conversation with Parents about Drug/Alcohol Risks				-3.962	.042	-.038	-2.303	.042	-.022	-.914	.043	-.009
Drug/Alcohol Education				-.459	.017	-.011	-.219	.017	-.005	-.051	.017	-.001
Risk Perception							-15.056	.029	-.208	-14.683	.029	-.203
Support from Parents										-2.566	.029	-.038
Support from Teachers										-1.519	.024	-.026
Adjusted R^2		3.0%			3.2%			7.3%			7.5%	

Note. All predictors in all four models are significant with p < .001, except Drug/Alcohol Education in Model 4 with p = .002

Model 2 of Table 3 shows that more conversation with parents about drug/alcohol risks was associated with higher risk perception of alcohol use (β = .060, *p* < .001). Thus, H2a was supported. Model 2 of Table 3 also shows that more drug/alcohol education was associated with higher risk perception of alcohol use (β = .058, *p* < .001). Thus, H2b was supported.

Table 3 *Hierarchical Regression of Predictors on Risk Perception (Based on the Weighted Sample)*

Predictors	Model 1			Model 2		
	B	*SE*	β	*B*	*SE*	β
Age	-.043	.000	-.106	-.039	.000	-.096
Gender	.185	.000	.137	.182	.000	.134
1 = Male; 2 = Female						
Race	.109	.000	.080	.113	.000	.083
1 = White; 2 = Non-White						
Family Income	.018	.000	.053	.016	.000	.046
Health	.034	.000	.041	.028	.000	.034
Education	.031	.000	.082	.028	.000	.074
Conversation with Parents about Drug/Alcohol Risks				.082	.000	.060
Drug/Alcohol Education				.032	.000	.058
Adjusted R^2			3.0%			3.8%

Note. All predictors in both of the two models are significant with *p* < .001.

Model 2 and Model 3 of Table 2 show that, after risk perception was entered into the model, the previous significant relationship between conversation with parents and alcohol use (β = -.038, *p* < .001) reduced in magnitude, but was still significant (β = -.022, *p* < .001). The Sobel test indicated that this reduction was statistically significant (*Z* = -519.17, *p* < .001). Thus, there was a partial mediation between more conversation with parents and less alcohol use though higher risk perception. RQ1a was answered.

Model 2 and Model 3 of Table 2 also show that, after risk perception was entered into the model, the previous significant relationship between drug/alcohol education and alcohol use (β = -.011, *p* < .001) reduced in magnitude, but was still significant (β = -.005, *p* < .001). The Sobel test indicated that this reduction was statistically significant (*Z* = -519.17, *p* < .001). Thus, there was a partial mediation between more drug/alcohol education and less alcohol use though higher risk perception. RQ1b was answered.

Model 4 of Table 2 shows that, after controlling for conversation with parents, drug/alcohol education, and risk perception, higher support from parents was associated with less alcohol use (β = -.038, *p* < .001); higher support from teachers was associated with less alcohol use (β = -.026, *p* < .001). Thus, H3a and H3b were both supported.

The hypothesized model explained 7.5% of variance in alcohol use. Conversation with parents, drug/alcohol education, risk perception, support from parents, and support from teachers explained 4.5% of variance above and beyond what was explained by demographics and health status. Figure 2 shows the final model based on hierarchical regression analyses.

Discussion

We proposed a conceptual model assuming that, among U.S. adolescents, both risk perception and social support are negatively associated with alcohol use. The model also hypothesizes that risk perception mediates the relationship between conversation with parents and alcohol use, and the relationship between drug/alcohol education and alcohol use. The proposed model was tested by a national sample of adolescents who completed the survey in the 2011 NSDUH. We found that risk perception and social support from parents/teachers reduce alcohol use among adolescents, and that higher risk perception serves as a partial mediator linking more conversation with parents to less alcohol use, and linking more drug/alcohol education to less alcohol use. Study contributions and implications are discussed below.
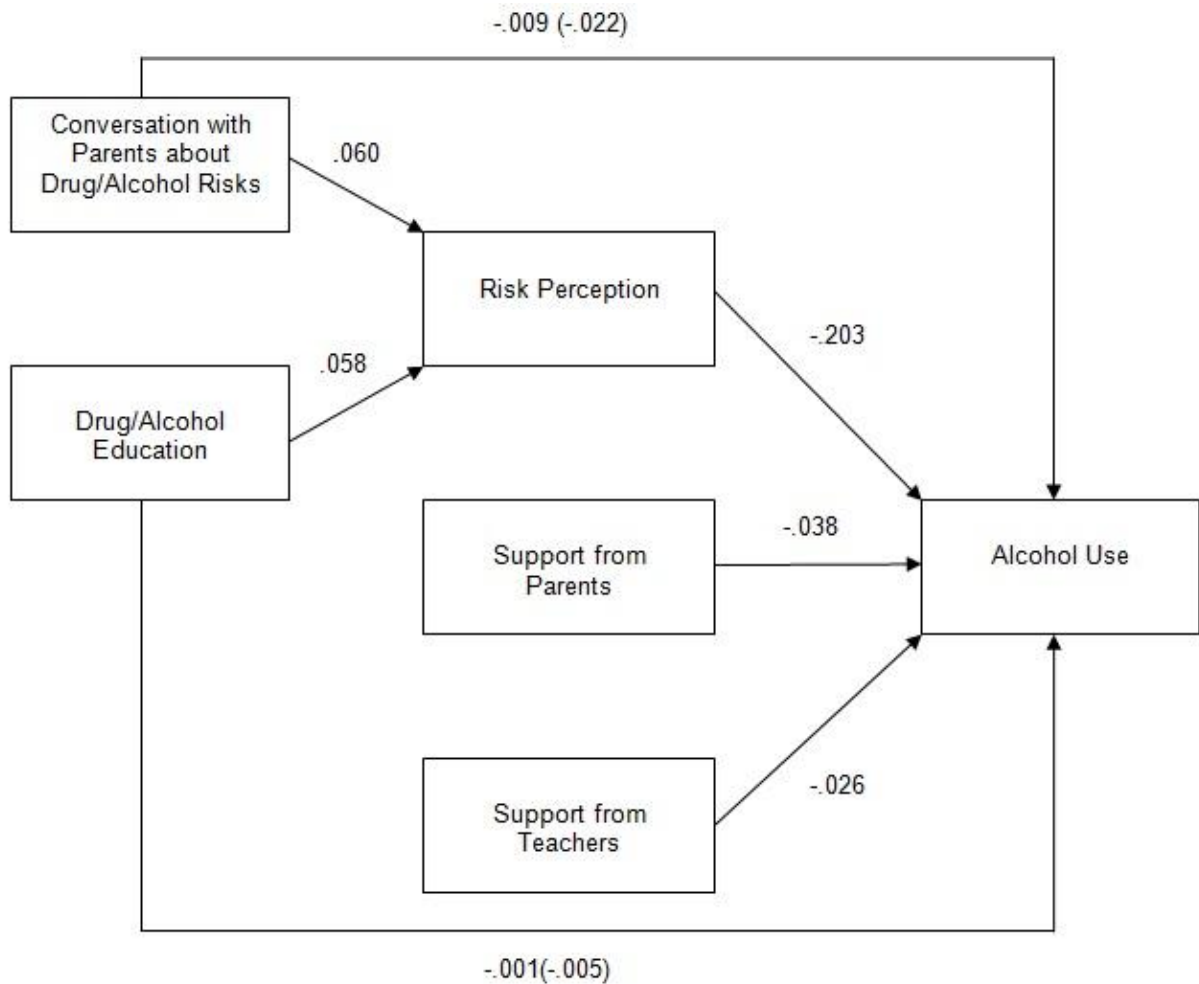
Figure 2 *Final model based on hierarchical regression analyses*

Note. The numbers represent standardized regression coefficients (all are significant with p < .01).

Numbers inside parentheses are coefficients before risk perception was entered into the model;

Numbers outside parentheses are coefficients after risk perception was entered into the model.

A first contribution of this study is that we examined risk perception and social support simultaneously as antecedents of alcohol use in adolescents, recognizing the unique impact of both personal beliefs and social environment. Previous researchers on alcohol use among adolescents either focused on personal beliefs that they hold (e.g., risk perception) (Birhanu et al., 2014; Grevenstein et al., 2015)., or the social environment surrounding them (e.g., social support) (Wei et al., 2011; Wormington et al., 2013). In fact, individuals' behavior is a function of the joint effects of both personal factors and environmental factors (Bandura, 2001). In the current study, we justified

that risk perception and social support are important factors that should both be included in studies on alcohol consumption among adolescents, and we teased out these two factors' separate effects on alcohol use among adolescents. In addition, we revealed that risk perception emerges as the strongest factor discouraging underage drinking, among all factors included in the study. This finding indicates that adolescents' personal belief about the risks of alcohol use is a more powerful protective mechanism against alcohol use than support from parents or teachers.

A second contribution of this study is that we revealed that parents and teachers are both potential

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sources of social support that protect adolescents from alcohol use. Adolescence is a vital period during which teens may be subject to the temptation of alcohol or other substances (McAloney, 2015). Whether social support is available may have a great influence on adolescents' lives. There is empirical evidence that receiving emotional support enhances one's sense of control toward life among adults aged 30 and older (Chen & Feeley, 2012). Perhaps this is also true for adolescents: those who receive higher support from parents and teachers also have higher perceived control; such perceived control acts as a regulator for teens' personal conduct, motivating them to stay away from risky behaviors. Another possible explanation is that social support from parents/teachers sends a message to adolescents that "my parents/teachers care about me and want me to do well and succeed in school and life." Such supportive messages can create in adolescents a sense of obligation to protect their own health and wellness in order to meet parents/teachers' expectations.

A third contribution of this study is that we identified a possible mechanism as to how conversation with parents and drug/alcohol education influence alcohol use among adolescents. Specifically, conversation with parents and drug/alcohol education may indirectly affect alcohol use through a two-step process. In the first step, information-based interventions (e.g., parent-child conversation, drug/alcohol education on and off campus) target risk perception of teens, a potential mediating variable, and increase it; in the second step, increased risk perception reduces alcohol use among teens (Karlsson, 2008). The key to this two-step process is that information-based interventions must be able to modify risk perception, which is associated with drinking behavior; otherwise, such interventions are unlikely to succeed in changing drinking behaviors (Karlsson, 2008). Based on the present findings, we suggest that, among adolescents, both conversation with parents and drug/alcohol education are potential intervention strategies to enhance risk perceptions of alcohol use, which may subsequently diminish alcohol use.

The finding that conversation with parents and drug/alcohol education influence alcohol use through the pathway of risk perception is consistent with the proximal-distal model of health-related outcomes (Brenner, Curbow, & Legro, 1995). That is, risk perception—a cognitive factor—is a proximal predictor of alcohol use, while conversation with parents and drug/alcohol education—two communication factors—are distal predictors of alcohol use. Based on the present findings, it appears that communication variables may indirectly affect risky behaviors through their direct influence on cognitive beliefs.

An interesting finding of this study is that drug/alcohol education, although effective, has a *very* small influence on adolescents' drinking behavior. This finding is in line with a review on literature from the period 1996 to 2006 about the effectiveness of health campaigns, which concluded that health campaigns engender small-to-moderate impacts on behaviors (Noar, 2006). This finding also lends support to Karlsson's (2008) argument that information-based drug preventions have a *very* small effect on drug use. One possible explanation for such small effect in the present study is that interventions that simply use hard facts to inform the audience of the risks of drug/alcohol use can sound cliché to teens, suggesting that more innovative approaches, such as entertainment-education, should be used (Slater & Rouner, 2002). Another possible explanation is that perhaps it is much more difficult to change behavior than to change intention, although intention has been treated as a proxy of behavior (Chen & Yang, 2015; Chen & Yang, 2017).

Another interesting finding of this study is that conversation with parents appears to be more effective than drug/alcohol education in reducing alcohol use among adolescents. Perhaps interpersonal communication, especially with parents, possesses the character of proximity and intimacy, making it more likely to increase adolescents' awareness of the risks of alcohol use. By contrast, prevention messages from drug/alcohol education may be ignored or receive little attention from teens due to message fatigue, a phenomenon that happens among individuals being exposed to long-term and repetitious public health messages (O'Neill, McBride, Alford, & Kaphingst, 2010).

Theoretical and Practical Implications

We proposed a conceptual model integrating two existing theoretical frameworks (i.e., the two-step process model and the main-effect model of social support). To our knowledge, no researcher has examined risk perception and social support simultaneously, nor has any researcher considered the roles of information sources in conjunction with risk perception and social support. Based on the present findings, social support and risk perception both serve as potential protective factors explaining unique variance in alcohol use among adolescents, and information sources can indirectly influence teens' alcohol use through their direct influences on risk perception. Thus, it appears that a theoretical model incorporating cognitive, social, and communication factors is more appropriate in predicting adolescents' drinking behaviors.

In light of the present findings, risk perception and social support are both potential targeting constructs in health intervention programs designed to reduce

alcohol use among adolescents. Administrators and teachers from schools should get parents involved in educating adolescents about alcohol-related risks, and encourage parents to talk with their children about refraining from alcohol use. Schools may offer workshops to parents regarding strategies of communication with their children about alcohol-related risks. Health intervention researchers and professionals should work closely with school administrators in developing more effective drug/alcohol education programs that increase risk perceptions about alcohol use. One challenging task is to translate findings from health intervention research into the design of effective drug/alcohol prevention messages. Parents should realize the power of their supportive messages in protecting their children from using alcohol. In addition, teachers should recognize that emotional support from them is equally important in preventing underage drinking, especially for adolescents who receive insufficient support from parents.

Limitations

Several limitations of this study should be noted. First, due to the constraints of the 2011 NSDUH dataset, we only examined risk perception of alcohol use, support from parents and teachers, parental communication about drug/alcohol risks, and drug/alcohol education as predictors. We did not explore the impacts of perceived control of alcohol use (Chen & Feeley, 2015), benefit perception of alcohol use (Chen, 2017), and non-permissive drinking norms of peers (Gryczynski & Ward, 2012), which are also potential protective factors, as these constructs are not available in the 2011 NSDUH dataset. Second, it is worth noting that, in large national surveys, variables are often measured by fewer items (e.g., a single item or two items) to reduce participants' burden and avoid fatigue (e.g., Chen & Feeley, 2014b; Chen & Yang, 2017). In the current study, risk perception was measured by two items representing a general assessment of harm associated with excessive drinking, and social support was measured by one or two items focusing on emotional support. Such single-item or two-item measures might incur more measurement error. Third, the effect sizes of some predictors (e.g., drug/alcohol education) are *very* small, although they are statistically significant ($p <= .002$). While small effect sizes are *not* uncommon in communication research (e.g., Chen & Feeley, 2012), we caution readers that the small but statistically significant effects of some predictors may be due to the large sample size in this study, which may increase the probability of making a Type I error. Fourth, considering the cross-sectional nature of this study, the causal directions proposed in the model are presumed and should be interpreted with caution.

Conclusion

We contribute to the health communication literature by revealing that risk perception and social support are both protective factors that reduce underage drinking. Another contribution of our study is that we identified conversation with parents and drug/alcohol education as potential information sources (i.e., information-based interventions) that can augment risk perception. A third contribution of our study is that we justified that risk perception serves as a potential psychological pathway linking more conversation with parents to less alcohol use, and linking more drug/alcohol education to less alcohol use. Future researchers should examine other cognitive constructs (e.g., perceived control; Chen & Feeley, 2015) in addition to risk perception, investigate peer-drinking norms, and use more comprehensive measures to assess risk perception (e.g., Chen, 2017) and social support (e.g., Chen & Bello, 2017), when studying the relationships among information-based interventions, risk perception, social support, and alcohol use. The experimental exploration of the effectiveness of risk information in changing cognitive beliefs (e.g., risk perception) is another potential research direction (e.g., Chen & Yang, 2015), which may generate fruitful results informing the design of drug/alcohol education programs targeting adolescents.

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