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Health literacy, alcohol expectancies, and alcohol use behaviors in teens

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Abstract

Objective—Alcohol expectancies are developed, in part, through exposure to health messages, the understanding of which may be influenced by health literacy. This study explores the relationships among health literacy, alcohol expectancies, and alcohol use behaviors in teens.

Methods—We studied alcohol use behaviors in the past six months in youths aged 14–19 recruited from two adolescent medicine clinics. We assessed covariate-adjusted bivariate relationships between HL, expectancies, and four measures of alcohol use and tested health literacy as a moderator of the relationship between expectancies and use.

Results—Of the 293 study teens, 45 percent reported use of alcohol in the past six months. Use behaviors were positively associated with higher health literacy and positive expectancies. Our moderation model suggested that health literacy moderates the relationship between expectancies and use, with the expectancy/use relationship being significantly stronger in higher literacy teens.

Conclusion—Findings suggest that health literacy can influence alcohol expectancies and behaviors. Practice implications: Health literacy should be explicitly considered in the design of alcohol prevention messages.

Keywords

Health literacy; Adolescence; Alcohol expectancies; Alcohol use

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Conflict of interest statement

The authors have no potential conflicts of interest report.

1. Introduction

In 2012, 41 percent of U.S. 12th graders and 27 percent of U.S. 10th graders reported using alcohol in the past 30 days. Twenty-eight percent and 14 percent, respectively, reported having been drunk [1]. While use rates have declined in the past decade, they remain unacceptably high particularly because individuals who begin heavy drinking as teens are more likely to become problem drinkers as adults [2]. These issues make understanding precursors of adolescent alcohol use behaviors a significant public health concern.

Expectancy theory has long been used as a model for understanding health behaviors including alcohol use [3] and, in teens, multiple alcohol expectancies have been identified as strong predictors of adolescent alcohol use behaviors [4–6]. Expectancy theory posits that an individual's behavior can be explained by his or her expectations for specific outcomes from that behavior [7]. For example, an alcohol expectancy could be stated as “I believe that if I drink alcohol, I will have more fun.” A person who believed this outcome to be true and who had a positive value for the outcome would be more likely to engage in drinking. Expectancies and their values can be developed and stabilized over time through personal experiences and through observed experiences of others. Importantly, they can also be influenced by educational and persuasive messages delivered interpersonally or through media [8]. Expectancy theory-based anti-drinking interventions, therefore, use messages that attempt to reduce positive expectancies and enhance negative ones for the effects of alcohol. Alcohol marketers and some peers, hoping to increase alcohol use, implicitly or explicitly, take the opposite approach.

Health literacy, defined as “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions” [9], may be an important factor in how such messages influence expectancies. In adults, health literacy is associated with disease knowledge, disease management, health outcomes, and healthcare cost [10–15]. General adolescent literacy is a compelling problem in the US and a significant number of adolescents are unable to read at the appropriate grade level [36]. Health literacy research among adolescents is still a developing field but recent studies show links with health behaviors and outcomes and has established some independent associations between lower health literacy levels and poorer understanding of preventive care information as well as limited access to preventive care services [16–19]. In addition, children of parents with lower literacy skills are more likely to have worse outcomes [37]. Recent studies in health literacy among adolescents link literacy rates with health behaviors and outcomes including online health information seeking, over-the-counter medication use, and obesity [16–19]. These studies further suggest that adolescents with limited literacy skills are less likely to receive benefits of preventive care [37].

As teens with low levels of health literacy come into adulthood, they face a variety of challenges in the healthcare system including completing medical forms, understanding instructions for prescription medications and comprehending provider instructions [28]. They also may be challenged in understanding and evaluating messages designed to influence health-related behaviors like alcohol use.

Few studies have examined relationships between alcohol usage and health literacy among adults. Among the few studies, associations between health literacy and alcohol consumption have been weak at best [38,39]. However one study in an adult population with alcohol dependency indicates that lower levels of literacy are positively associated with increased addiction severity [40]. Another recent study found that high and appropriate levels of alcohol literacy are a prerequisite for moderate alcohol consumption [41].

On the other hand, studies on alcohol usage and literacy among youths demonstrate stronger associations between adolescents' reading below their grade level and substance use behaviors. Boys with low literacy levels, in particular, have been reported to be almost three times more likely to use alcohol than boys with high literacy levels [42] and chances of having misused alcohol were higher among students with lower literacy levels than among students with higher literacy levels [43].

In this analysis, we explore the relationships between health literacy, alcohol expectancies, and alcohol use behaviors in adolescents. Understanding how health literacy is associated with teen alcohol expectancies and alcohol use behaviors could provide important guidance for the development and improvement of messages targeted at populations with varying health literacy levels. We also test a hypothesized model of health literacy influences or moderates of the relationship between expectancies and alcohol use behaviors (Fig. 1). In this model, the effect of alcohol expectancies and use behaviors would be expected to be different at different levels of health literacy.

2. Methods

This analysis is conducted using data from an adolescent health and wellness study involving youths between the ages of 14 and 19 recruited from adolescent medicine clinics in Columbus, Ohio and Pittsburgh, Pennsylvania. Both recruitment clinics are associated with urban, academic medical centers and offer a broad range of primary care, family planning, sexual health, and specialty care services. Beginning in 2008, teens have been enrolled in the study through a purposive recruitment process designed to balance our population by age, gender, race, and sexual orientation. Participants were recruited using a combination of physician referral and computerized eligibility screening. Youths are eligible for the study if they meet the age requirements and if they can read English at a 6th grade level. No clinical conditions were used as inclusion or exclusion criteria. All elements of the study were approved by IRB committees at each institution.

Recruited youths attend study visits where parental informed consent and youth assent are obtained for youths ages 14–17 and participant consent is obtained for those ages 18 and over. Each participant then completes a health literacy assessment and a computer-assisted battery of questionnaires on health behaviors and potential mediators and moderators of health behavior development.

Measures used in analysis are described below:

Demographics

Demographic information collected from each participant includes gender, race (summarized for this analysis as white, black, and other), and date of birth. Same-sex attraction is assessed by two items asking how much sexual attraction the respondent has to males and to females. Any response other than 100 percent attraction to the opposite sex is coded as “same-sex attraction”. This is not a key variable of interest in this study but it is included for adjustment in multivariate models to account for the oversampling within that population. No direct measure of socio-economic status (SES) is collected in this study because all of the data is reported directly from youths who may not be able to reliably report household incomes [20]. Instead, we used two proxy measures of SES: parental education and free lunch status. Any parental college was coded as “yes” if the youth reported that at least parent had at least some post-high school education. Free lunch was coded as “yes” if the youth reported that they were currently eligible for free lunch or if they were eligible for free lunch in the last year that they attended school.

Health literacy

Adolescent health literacy is assessed using the Rapid Estimate of Adult Literacy in Medicine, teen version (REALM-Teen) [21] which was validated in teens ages 10 to 19 and correlates with measures of general literacy and with health behaviors known to be associated with health literacy. This interviewer-administered tool requires respondents to read a list of 66 health-related terms. Scoring is based on the number of items correctly read. While the REALM does not comprehensively measure the construct of health literacy, research in teens and in adults has found high correlations between it and the Test of Functional Health Literacy in Adults (TOFHLA), a longer, more comprehensive (often considered “gold-standard”) tool that measures understanding of words in context [44,45]. For our analyses health literacy is dichotomized as LOW—below 8th grade equivalent (REALM-teen score ≤ 58) and HIGH—8th grade equivalent or higher (REALM-Teen score ≥ 59). This cut point was chosen so that all persons classified as low actually scored below their current grade level.

Alcohol use behaviors

Four alcohol use variables were chosen for study in order to determine if relationships varied by nature of use. All variables are measured based on behaviors in the past six months. “Any alcohol” is coded as “yes” if the respondent indicated any response other than “not at all” to the question “In the past 6 months, how often did you drink beer, wine, wine coolers, or liquor?” and “Regular drinking” is coded as “yes” if the participant responded “once per month” or more often to the same question. Binge drinking was coded as “yes” if any response other than “not at all” was given to the question “In the past 6 months, how often did you drink five or more drinks when you were drinking? Finally, a respondent was classified as having problems related to drinking if they responded more than “never” to one of eight items measuring interpersonal problems with family or friends, physiologic problems including hang over and nausea, and self-control issues including fighting and regrettable sexual activity.

Alcohol expectancies

Alcohol expectancies were measured using the comprehensive expectancies of alcohol (CEOA) measure [22]. This 38-item tool includes seven subscales and was validated in a college-age population. All items are measured on a four point scale ranging from 1—disagree to 4—agree. Four subscales measure positive expectancies toward alcohol use: increased sociability, tension reduction, increased bravery and creativity (liquid courage), and enhanced sexuality. Three additional subscales measure negative expectancies: cognitive and behavioral impairment, increased risk taking and aggression, and negative self-perceptions. The score for each scale is calculated as the average of the Likert-scale responses for the items in the scale.

Descriptive analyses summarize the sample demographics by health literacy level. Demographic differences in health literacy were assessed using the chi-squared test. Mean expectancy scores, ranging from 1-completely disagree to 4-completely agree were calculated for those who did and did not acknowledge each alcohol use behavior. The relationship between mean expectancy subscale scores and behavior were tested using Student's t-test. All tests were considered significant at the 0.05 level.

Next, we tested whether health literacy moderates the relationship between alcohol expectancies and alcohol use behaviors. A variable is considered to be a moderator if the relationship between a predictor and an outcome varies at different levels of the proposed moderator variable. Moderation was tested using the Process macro for SAS [24]. Moderation was considered present if the interaction term of health literacy expectancy was significant in a model predicting use behavior, after controlling for potential confounders. To illustrate the magnitude of moderation, literacy-stratified adjusted odds ratios are presented for each expectancy and behavior.

All multivariate models control for age, gender, race, sexual attraction, free lunch eligibility and parental education.

3. Results

The study sample includes 293 adolescents of whom 70 percent are female and 45 percent are white (Table 1). Slightly over half (54 percent) reported at least one parent with some post-high school education. Alcohol use behaviors were common in this population of adolescents who are all below the legal drinking age. Overall, 45 percent reported any alcohol use in the past six months, 31 percent reported problems associated with drinking, and 20 percent reported at least one incident of binge drinking. Twelve percent of respondents reported drinking at least once per month.

Nearly a quarter of participants had lower health literacy. Lower health literacy was associated with younger age, Black race, free lunch status, and lower parental education. Health literacy was also associated with drinking, regular drinking and problems associated with drinking.

Overall, the most strongly held positive expectancy about alcohol use was that it would improve sociability, and the weakest positive expectancy was that it would enhance sexuality (Table 2). The most strongly held negative expectancy was that alcohol use would cause cognitive/behavioral impairment.

After adjustment for demographic factors, all positive expectancies were significantly associated with each of the alcohol use behaviors studied (Table 3). Expectation for enhanced sociability consistently had the strongest association. Negative expectancies had less consistent relationships. Expectancy for negative self-perception was associated with any, binge, and problem drinking and expectancy for cognitive/behavioral impairment was associated with any, regular, and problem drinking. Expectancy for enhanced risk taking and aggression was not associated with any studied behavior.

The relationships between expectancies remained significant after adding health literacy to the demographics adjusted model (Table 4) and the hypothesized moderation role for health literacy trended toward but did not reach significance for each positive expectancy. Strongest evidence of moderation was seen for tension reduction (interaction effect $p = 0.055$). Analyses stratified by health literacy level showed that the only significant expectancy for lower literacy teens was sociability (Table 4). For higher literacy teens, however, all expectancies except risk/aggression were significant. No moderation relationship was found for health literacy and expectancies for the other three use behaviors studied.

4. Discussion and conclusions

4.1. Discussion

Our results show that underage alcohol use remains a significant problem. Consistent with previous research, expectancies were significant predictors of alcohol use behaviors in teens [4–6]. This study, however, expands upon existing knowledge by illustrating how health literacy influences the relationship between expectancies and alcohol use behaviors. Our results suggest that expectancies are more strongly predictive of alcohol use behaviors in teens with higher health literacy scores. Interestingly, this moderation effect was true only in the case of “any alcohol use” in the past six months and was not found for specific behaviors/outcomes within alcohol users like binge drinking, regular drinking, or experiencing drinking related problems.

When hypothesizing how health literacy could enhance the effect of alcohol expectancies, we considered the relationship between health literacy scores and the capacity to use health information to make health-related decisions. Research on developmental aspects of adolescent health decision making suggests that there are two primary models through which teens make decisions regarding health risk behaviors: (1) rational decision making where decision are based on perceived risk-reward trade-offs (e.g., health belief model, theory of planned behavior) and (2) reactive (non-deliberative) decision making based on the immediate decisional environment [26]. Youths with lower health literacy may have lowered capacity for rational decision making and therefore lean toward reactive decision making, creating the observed relationship differential. Additional quantitative and

qualitative research on specific decision making models by higher and lower literacy teens, controlling for developmental variables, could help to elucidate this relationship.

Another potential explanation for the identified relationships relates to media effects. Media messages are of particular importance in this population because adolescents are heavy users of media where alcohol promotion is ubiquitous [27]. The Framework for Adolescent Health Literacy posits that media messages can affect health literacy but understanding of those messages can also be modified by health literacy [28]. Prior research on adolescent alcohol use points to a link among media use, exposure to alcohol related media content, and exposure specifically to alcohol advertising with alcohol use [29–35]. Thus, one plausible hypothesis is that adolescents with high health literacy may be subjected to greater advertising influences than those adolescents with low health literacy who may be less able to read and/or understand the messages and thus be less likely to be influenced by them. It may also be that adolescents with higher health literacy are more likely to understand the nuances of messaging aimed at adults. More detailed study is required to better understand how adolescents with low and high health literacy understand and evaluate media messages about alcohol, including alcohol ads.

The fact that moderation of expectancies was suggested for alcohol use but not for behaviors/outcomes in alcohol users may be related to the ways in which expectancies are developed. For alcohol users, expectancies are most strongly shaped by personal experiences. However, non-users, who do not have personal experiences to draw upon, must base expectancies on messages (positive and negative) from media, peers and other sources. Understanding of such messages may be substantially influenced by health literacy, creating the stronger health literacy moderation effect in the use/non-use decision. This would suggest that literacy-tailoring will have a greater value for expectancy-based interventions directed at preventing alcohol use than for those designed to reduce or stop existing use. Alternatively, the lack of a significant moderation effect may be the result of reduced power associated with the smaller number of youths endorsing problem, binge and regular drinking.

A few limitations of this study should be noted. First, we note that the REALM-teen, while being the most used and best validated measure of health literacy in adolescents, is an incomplete measure of the construct of health literacy. It does not allow assessment of understanding or application of health information. Our findings support that health literacy as measured by the REALM-teen has an impact on the relationship between expectancies and behaviors but this may or may not translate to a relationship with the construct measured more broadly. As new, more comprehensive health literacy measures are developed, we will be able to revisit this question in more detail. Second, it is possible that our measure of health literacy is acting, in part, as a proxy for socio-economic status (SES). Teens with higher SES are known to have higher rates of alcohol use and higher rates of high health literacy. Our use of parental education and free lunch status as proxy measures for SES may not have fully controlled for this relationship. Third, the participants in this sample were recruited from academic adolescent medicine clinics. These youths may differ significantly from teens who seek care from other types of providers or from teens not receiving health care and therefore generalizability is limited. Finally, we note that all of the studied alcohol

use behaviors were collected via self-report and may be subject to social desirability bias. The use of computer based self-interviewing rather than interviewer administered questionnaire was employed to reduce this bias.

4.2. Conclusion

To date, research on adolescent health literacy has found relationships with health behaviors and health outcomes but studies have not modeled the mechanism for these relationships. This exploratory study sought to generate hypotheses on such mechanisms. Our results suggest novel relationships between health literacy, alcohol expectancies, and alcohol use.

4.3. Practice implications

Findings support the idea that health literacy should be explicitly considered in the design of alcohol prevention messages. Additionally, they support the importance of practitioners ensuring that alcohol use prevention and reduction messages are understood by teens at all health literacy levels. Prevention counseling in higher literacy teens may be more effective when focused on reduction of positive expectancies while other targets may need to be found for lower literacy youths.

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Fig. 1.
Theorized model of the relationship among expectancies, health literacy, and behaviors.

Table 1

Sample demographics.

Characteristic	Total <i>n</i> (%)	High literacy <i>n</i> (%)	Low literacy <i>n</i> (%)
Total	293	222 (75.8)	71 (24.2)
Gender			
Male	89 (30.4)	61 (27.5)	28 (39.4)
Female	204 (69.6)	161 (72.5)	43 (60.6)
Race *			
White	133(45.4)	111 (50.0)	22 (31.0)
Black	150 (51.2)	102 (46.0)	48 (67.6)
Other	10 (3.4)	9 (4.0)	1 (1.4)
Age *			
14-15	66 (22.5)	40 (18.0)	26 (36.6)
16-17	145 (49.5)	114 (51.4)	31 (43.7)
18-19	82 (30.0)	68 (30.6)	14 (19.7)
Any parental college *	186 (63.5)	153 (68.9)	33 (46.5)
Free lunch eligibility *	183 (62.5)	131 (59.0)	52 (73.2)
Same sex attraction	82 (28.0)	67 (30.2)	15 (21.1)
Alcohol use past 6 months			
Any use	132 (45.0)	109 (49.1)	23 (32.4)
Experienced problems due to drinking	93 (31.7)	78 (35.1)	15 (21.1)
Drinking at least once a month	35 (11.9)	33 (14.9)	2 (2.8)
More than 5 drinks in a sitting at least once	58 (19.8)	48 (21.6)	10 (14.1)
Alcohol expectancies mean (sd) ^a			
Sociability	2.33 (0.98)	2.38 (0.98)	2.16 (0.97)
Tension reduction	2.12 (1.02)	2.15 (1.01)	2.05 (1.05)
Liquid courage	2.06 (0.94)	2.09 (0.95)	2.01 (0.90)
Sexuality	1.77 (0.95)	1.77 (0.96)	1.79 (0.94)
Cognitive behavioral impairment *	2.76 (0.93)	2.85 (0.92)	2.47 (0.94)
Risk/aggression	2.26 (0.92)	2.26 (0.91)	2.25 (0.98)
Self-perception	2.09 (0.95)	2.10 (0.96)	2.07 (0.91)

* Statistically significant difference between high and low literacy groups $p < 0.05$.

^a Expectancy scores range from 1 to 4 with 4 representing complete agreement with all items in the scale.

Table 2

Mean expectancy scores by alcohol use behavior in the past 6 months^a.

Positive					Negative		
Characteristic	Sociability	Tension reduction	Liquid courage	Sexuality	CBI^b	Risk/aggression	Self-perception
No use	1.93	1.73	1.76	1.46	2.93	2.32	2.26
Any use	2.77	2.55	2.41	2.10	2.57	2.18	1.91
Problems	2.97	2.68	2.61	2.27	2.59	2.26	1.83
Binge	3.04	2.74	2.67	2.24	2.58	2.38	1.75
Regular	3.14	2.86	2.82	2.43	2.43	2.47	1.81

^aExpectancy scores range from 1 to 4 with 4 representing complete agreement with all items in the scale.

^bCBI = cognitive/behavioral impairment.

Table 3Adjusted bivariate relationships with alcohol use behaviors^a.

	Any alcohol use	Regular	Problem	Binge
Health literacy	0.74 (0.40-1.37)	0.24 (0.55-1.09)	0.71 (0.36-1.41)	0.90 (0.40-2.01)
Sociability	2.66 (1.94-3.63)	3.02 (1.77-5.16)	3.38 (2.35-4.87)	2.81 (1.87-4.20)
Tension reduction	2.21 (1.66-2.94)	2.14 (1.40-3.28)	2.18 (1.64-2.92)	1.98 (1.43-2.74)
Liquid courage	2.11 (1.57-2.84)	2.56 (1.59-4.10)	2.69 (1.94-3.74)	2.26 (1.57-3.26)
Sexuality	2.03 (1.50-2.75)	1.97 (1.35-2.88)	2.26 (1.68-3.05)	1.77 (1.30-2.40)
CBI	0.63 (0.47-0.83)	0.59 (0.38-0.92)	0.74 (0.55-0.99)	0.75 (0.53-1.05)
Risk and aggression	0.85 (0.64-1.13)	1.36 (0.88-2.10)	1.05 (0.78-1.40)	1.19 (0.84-1.68)
Self-perception	0.67 (0.51-0.89)	0.71 (0.45-1.11)	0.63 (0.47-0.86)	0.57 (0.39-0.83)

Note: Bold indicates significant relationship $p < 0.05$.

^a Odds ratio adjusted for gender, age, parental education, **free lunch eligibility**, same-sex attraction, and race.

Table 4

Moderation of the expectancy/alcohol use relationship by health literacy.

Expectancy	Adjusted OR full sample (95% CI) ^a N = 272	Adjusted OR high literacy only (95% CI) ^b N = 204	Adjusted OR low literacy only (95% CI) ^b N = 68
Sociability	2.86 (2.07-3.96)*	3.23 (2.19-4.77)*	2.19 (1.16-4.14)*
Tension reduction	2.31 (1.73-3.09)*	2.83 (1.97-4.06)*	1.50 (0.89-2.60)
Liquid courage	2.19 (1.62-2.97)*	2.51 (1.76-3.57)*	1.46 (0.76-2.81)
Sexuality	2.16 (1.59-2.94)*	2.40 (1.65-3.48)*	1.71 (0.94-3.11)
CBI	0.60 (0.45-0.80)*	0.55 (0.39-0.77)*	0.75 (0.41-1.37)
Risk and aggression	0.87 (0.66-1.15)	0.81 (0.58-1.13)	1.20 (0.64-2.28)
Self-perception	0.67 (0.51-0.88)*	0.61 (0.44-0.84)*	1.02 (0.55-1.91)

^a Odds ratio adjusted for health literacy, gender, age, parental education, free lunch eligibility, same-sex attraction, and race.^b Odds ratio adjusted for gender, age, parental education, free lunch eligibility, same-sex attraction, and race.