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Longitudinal associations between alcohol-related cognitions and use in African American and European American adolescent girls

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Abstract

Background—African American (AA) girls initiate alcohol use later and drink less than European American (EA) girls, potentially reflecting differences in the development of drinking behaviors. The current study examined alcohol-related cognitions: expectancies, attitudes, and intention to drink, as possible sources of variation by race in alcohol use. The aim of the current study was to characterize the nature and degree of association between these cognitions and use over time and by race in EA and AA girls.

Methods—Data were drawn from the longitudinal Pittsburgh Girls Study (PGS, N=2,450), an urban population-based sample of girls and their caregivers recruited when girls were between ages 5 and 8, and assessed annually through adolescence. Cross-lagged panel models were conducted separately by race (56.2% AA, 43.8% EA) to identify patterns of association between alcohol use and cognitions from ages 12–17 in 2,173 girls.

Results—Endorsement of cognitions and use were higher overall in EA than AA girls but the magnitude of cross-lagged path coefficients did not differ significantly by race. In both groups, bidirectional effects emerged between intentions and use, and alcohol use largely predicted cognitions across ages. However, intention to drink was the only alcohol-related cognition that consistently predicted subsequent use (odds ratios ranged from 1.55–2.71).

Conclusions—Although rates of alcohol use and endorsement of cognitions were greater in EA than AA girls, the anticipated racial differences in longitudinal associations between cognitions and use did not emerge, indicating that variation in associations between use and cognitions does not account for the lower prevalence of alcohol use in AA compared to EA girls. Furthermore, our finding that intention to drink is a consistent, robust predictor of subsequent alcohol use suggests

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the need to investigate potentially modifiable factors that influence intention to drink across racial groups.

Keywords

adolescents; alcohol use; African American; expectancies; race differences; female

Introduction

The average age at first alcohol use among girls has decreased in recent decades, now varying little from that of boys (Keyes et al., 2008, Miech et al., 2016). Along with this closing gender gap comes an increase in potential alcohol-related harms that disproportionately affect adolescent girls and young women (e.g., sexual risk taking that could result in unplanned pregnancy). Similarly, although the timing of initiation of alcohol use is typically later for African American (AA) versus European American (EA) youth, there is evidence suggesting that African Americans experience greater alcohol-related harms at the same level of exposure (Zapolski et al., 2014). Refinement of alcohol use prevention efforts for girls necessitates a clearer understanding of the sources of variation by race in drinking behaviors, which may include proximal individual level factors such as alcohol expectancies, attitudes toward alcohol use, and intention to drink.

Alcohol Expectancies

Alcohol expectancies, commonly classified as positive or negative, are expectations about the effects of alcohol. Positive expectancies include feeling happy, more confident, or relaxed and are associated with elevated likelihood of alcohol use (Aas et al., 1998; Colder et al., 1997; Patrick et al., 2009), whereas negative expectancies include feeling sick or depressed and are linked to lower likelihood of use (Callas et al., 2004). Expectancies precede alcohol use (Lang and Stritzke, 1993) and are primarily negative in the childhood to early adolescent years but become increasingly positive across adolescence (Aas et al., 1998; Hipwell et al., 2005; Jester et al., 2015). Several studies have assessed for distinctions between AA and EA youth in positive expectancies. With few exceptions (see Corvo, 2000), positive expectancies have been found to be higher in European Americans (Antin et al., 2014; Chartier et al., 2009; Randolph et al., 2009; Slutske et al., 2002). The magnitude of the association between positive expectancies and initiation of alcohol use also appears to be stronger in EA than AA youth (Banks et al., 2017; Chartier et al., 2009). Earlier work, including studies with the sample used in the current study (Chung et al., 2008; Hipwell et al., 2005), has further shown greater growth in positive expectancies, and fewer negative expectancies about alcohol in the pre-adolescent years among EA versus AA girls (Jester et al., 2015).

Attitudes Toward Alcohol Use and Intention to Use Alcohol

As in the case of alcohol expectancies, attitudes toward alcohol use develop before alcohol is ever consumed (Johnson et al., 1997) and attitudes during childhood have been shown to predict experimentation with alcohol (i.e., sipping) by age 12 (Donovan and Molina, 2014). Investigations of attitudes toward alcohol use have consistently found - from elementary

school aged children (Rinehart et al., 2006) to college students (Antin et al., 2014) to women from the general population (Herd, 1997) - that African Americans tend to hold less positive attitudes toward alcohol use than European Americans.

Intention to drink has been shown to predict subsequent drinking (Andrews et al., 2008; Maddahian et al., 1988; Payne et al., 2016; Webb et al., 1996), but the literature on racial differences in intention to use alcohol is mixed. For example, in an elementary school aged sample, AA children reported lower intention to drink as an adult than EA children (Rinehart et al., 2006). By comparison, in a study of 7th to 9th graders, Maddahian and colleagues found no differences between AA and EA youth with respect to intention to use alcohol or the magnitude of association between intention and actual alcohol use (Maddahian et al., 1988). Further, in a prior study with the sample used in the current investigation, intention to drink at ages 8 to 10 also did not differ by race (Hipwell et al., 2005). We extend our earlier analyses on childhood intention to drink among young females by focusing on intentions to drink in relation to alcohol use during adolescence, when drinking behavior begins to increase.

Reciprocal Associations Between Alcohol-related Cognitions and Alcohol Use

Although typically conceptualized as predictors of future alcohol consumption or correlates of current drinking behaviors, alcohol-related cognitions are not static and may be influenced by experience with alcohol. There is some evidence that the association between expectancies and alcohol use in adolescents is reciprocal (Bauman et al., 1985). For example, in a study of adolescents followed from 7th to 9th grade, the expectation of enhanced social behavior predicted initiation of alcohol use, which in turn predicted social enhancement expectancies in subsequent years (Aas et al., 1998). Other investigators using longitudinal data from children assessed between ages 11 and 17 found support for reciprocal associations between expectancies and alcohol use over an even broader age range (Jester et al., 2015). Expectations of social enhancement or relaxation predicted onset of binge drinking and both first intoxication and alcohol use were associated with a subsequent increase in social enhancement/relaxation expectancies. Another recent longitudinal study of early adolescents (ages 12 to 15) also indicates that the links between alcohol use and intention to drink are bidirectional (Payne et al., 2016). However, investigations of reciprocal influences between alcohol use and alcohol-related cognitions to date have not included attitudes toward alcohol use. Furthermore, racial differences in these links, which may underlie in part the distinctions across race in drinking behaviors, have yet to be examined.

Aims of the Current Study

The current study aimed to characterize the nature and degree of association between alcohol-related cognitions and alcohol use in girls, including its variation over time and by race - important considerations in the development of interventions that target these cognitions. Toward that end, we assessed the extent to which alcohol-related expectancies, attitudes, and intention to drink predicted subsequent alcohol use, and whether alcohol use in turn predicted these alcohol-related cognitions in AA and EA girls from ages 12 to 17. African Americans have shown delayed alcohol onset in comparison to European Americans (Galvan and Caetano, 2003, Zapolski et al., 2014) and there may be a corresponding delay in

the development of relationships between cognitions and use for African Americans (Antin et al., 2014). Given our focus on the early period of risk for alcohol involvement, we expected to observe a greater magnitude of association between cognitions and use for EA than AA girls. This hypothesis was based as well on distinctions by race in factors that may influence the likelihood of alcohol related cognitions translating into alcohol use, e.g., greater parental disapproval (Beck et al., 1995) and lower perceived peer use (Duncan et al., 2012) among AA vs. EA youth. Further, as previous work has evinced bidirectional relationships between certain cognitions (expectancies and intention to drink) and alcohol use (Aas et al., 1998; Payne et al., 2016), we expected reciprocal relationships to emerge for these previously studied cognitions as well as attitude toward alcohol use.

Methods

Participants

The Pittsburgh Girls Study (PGS; $N=2,450$) is a longitudinal study of an urban community sample of four female age cohorts (ages 5–8 at wave 1), oversampled for low income neighborhoods. Recruitment and ascertainment of the sample occurred from 1999–2000, and the first wave of data collection was completed by 85.2% of eligible families. Girls and their primary caregivers were interviewed annually using an accelerated longitudinal design. Detailed descriptions of ascertainment strategies can be found in prior publications (Hipwell et al., 2002, Keenan et al., 2010). Given our focus on differences between AA and EA girls in the present study, participants identified by their primary caregiver as “other race” ($n=144$) were excluded from analyses. Participants missing data on alcohol use and alcohol-related cognitions at all ages ($n=133$) were also excluded from analyses. The final analytic sample included 2,173 AA (56.2%) and EA (43.8%) girls. Retention for the PGS sample was high: 88.5% on average over the data collection years that were included in the present analyses (2003–2010, when girls were 12–17 years of age). Attrition analyses indicated that individuals who were not included in the analyses were more likely to endorse a positive attitude toward alcohol use at age 12 and to have conduct problems at age 12, and that EA girls were more likely to be excluded, but associations with missingness were very modest (r 's = .05, .04, and .07, respectively).

Procedure

Written informed consent from primary caregivers and verbal assent from girls were obtained before data collection began. Annual face-to-face interviews were conducted separately for the girl and her primary caregiver (94% of whom were mothers) in the home by highly trained research staff. The protocol received approval from the Human Research Protection Office at the University of Pittsburgh. Respondents were compensated for participation in the study.

Measures

Alcohol-related cognitions and use (assessed annually)—*Alcohol use* over the past year was measured via the Nicotine, Alcohol, and Drug Substance Use measure (Pandina et al., 1984). Response options for frequency of alcohol use ranged from 0 (*no use in the past year*) to 7 (*more than once per day*). Due to low frequency of alcohol use,

particularly in early adolescence, a dichotomous variable was used to represent past year alcohol use (0=*no*, 1=*yes*).

Positive and negative expectancies about the effects of alcohol were assessed with the Drug, Alcohol, and Tobacco Expectancy Questionnaire (Hornik et al., 2002). This scale includes four positive expectancies items (e.g., “I would have a good time with friends,” “I would be more relaxed”) and four negative expectancies items (e.g., “I would lose control of myself,” “It would upset my parents/caregivers”) that are rated on a 5-point Likert scale ranging from 0 (*very unlikely*) to 4 (*very likely*). Higher scores indicate stronger expectancies about the effects of alcohol. Scores for positive and negative alcohol expectancies ranged from 0–4 at each age. Internal consistencies ranged from 0.88–0.90 and 0.85–0.88 for positive expectancies in AA and EA girls, respectively, across the six waves. For negative expectancies, the ranges were 0.58–0.70 for AA girls and 0.66–0.77 for EA girls.

Attitudes toward alcohol use were queried using two items. Negative attitude was assessed with the item “How wrong do you think it is for someone your age to drink alcohol?”, rated on a 4-point scale ranging from 0 (*not wrong at all*) to 3 (*very wrong*). Positive attitude toward alcohol was assessed with the item “Is it OK for someone your age to drink alcohol?” coded dichotomously (0=*no*, 1=*yes*). To avoid redundancy, we opted to include only one item measuring attitude toward alcohol use. We chose the positive attitude toward alcohol use item, as it more closely captures the construct as it has been assessed in prior studies, i.e., approval of alcohol use.

Intention to use alcohol was assessed using one item, “How likely is it that you would drink alcohol even once or twice in the next year?” Response categories ranged from 1 (*definitely not*) to 4 (*definitely yes*).

Other psychosocial factors associated with alcohol use—Models also included psychosocial factors associated with adolescent alcohol use: socioeconomic status (Hanson and Chen, 2007), timing of pubertal development (Wichstrøm, 2001), and conduct problems (Brown et al., 1996).

Socioeconomic status was indexed by primary caregiver reports of highest level of education completed (0=*12 or more years*, 1=*fewer than 12 years*), household receipt of public assistance (0=*no*, 1=*yes*), and single parent household status (0=*no*, 1=*yes*). The latter two indicators were represented in models as time-varying covariates. As primary caregiver educational status was stable over time, status was based on reports in age 12 interviews and represented in models as time-invariant.

Pubertal timing was operationalized according to menarche status at age 11 (with menarche by age 11 indicating early puberty), using a single self-reported item from the Pubertal Development Scale (0=*no*, 1=*yes*) (Petersen et al., 1988).

Conduct problems (assessed annually) were derived from primary caregiver reports on the Child Symptom Inventory-Fourth Edition (Gadow and Sprafkin, 1994), which assesses the frequency of 15 conduct disorder symptoms over the past year. Symptoms are rated on a 4-point scale (0=*never* to 3=*very often*) and summed to generate a severity score from 0–45.

Reliability coefficients ranged from 0.71–0.82 for AA girls and 0.67–0.80 for EA girls. Conduct problems were represented in models as time-varying covariates.

Analytic Strategy

Given our interest in developing models of the longitudinal associations between alcohol use and related cognitions in AA girls, cross-lagged panel model analyses were conducted separately by race, as in prior work (Foster et al., in press). Post-hoc tests were conducted to formally test for differences across race, as described below.

Cross-lagged panel models were conducted in Mplus 7.3 (Muthén and Muthén, 2014). These models contain three types of relationships: (1) Concurrent correlations are the non-directional associations between two different variables assessed at the same time point (e.g., age 17 alcohol use and age 17 intention to use alcohol). (2) Autoregression coefficients indicate temporal stability of the construct over time, i.e., the extent to which the value of a given variable predicts the value of that same variable at a subsequent time point (e.g., age 14 positive attitude toward alcohol use predicting age 15 positive attitude toward alcohol use). (3) Cross-lagged relationships reflect the degree to which the value of one variable assessed at a given time predicts the value for a different variable at a subsequent time point (e.g., age 15 negative expectancies predicting age 16 alcohol use), after accounting for concurrent correlations and autoregressive effects. Maximum likelihood estimation with robust standard errors (MLR) was utilized to handle missing data on endogenous variables and to account for non-normality in continuous variables. MLR performs linear regression on continuous endogenous variables and logistic regression on binary endogenous variables. (Note that model fit statistics are not available when estimating models with binary or categorical endogenous variables (Muthén and Muthén, 2014)).

Analyses proceeded in three stages, with modeling conducted separately for AA and EA subsamples. In the first stage, bivariate cross-lagged models between alcohol use and alcohol-related cognitions (positive expectancies, negative expectancies, positive attitude, and intention to use alcohol) were conducted to evaluate the unconditional relationship between alcohol use and each construct (Figure 1). In the second stage, multivariate cross-lagged models between alcohol use and all four constructs simultaneously were conducted to estimate their independent contributions to alcohol use in the context of the other constructs. In the third stage, covariates (single parent household, household receipt of public assistance, conduct problems, primary caregiver education level, and the indicator of early puberty) were added to the multivariate cross-lagged models.

Multi-group models are not feasible with MLR estimation to test for racial differences. Thus, post-hoc comparisons of corresponding path coefficients in the multivariate, covariate adjusted models for the AA and EA subsamples were conducted by computing Wald tests statistics (by hand), with path estimates and standard errors obtained in Mplus. False discovery rate (FDR) adjusted p-values (Benjamini and Hochberg, 1995) were used for each between-group comparison (60 in total) of the multivariate cross-lagged panel models to minimize Type 1 error.

Results

Alcohol Use and Alcohol-related Cognitions from Ages 12–17

Demographic and psychosocial characteristics at age 12 are presented by race in Table 1. Differences between racial groups were observed for all characteristics, with AA girls more likely than EA girls to endorse indicators of low SES as well as early puberty and conduct problems. Year-by-year means and rates of endorsement of alcohol-related cognitions and alcohol use are reported by race in Table 2. The annual prevalence of alcohol use increased over time for both AA and EA girls but was consistently lower in AA girls. Across race, positive expectancies, negative expectancies, intention to use alcohol, and positive attitude toward alcohol use increased over time. Differences by race were observed by age 14 for all alcohol-related cognitions except for negative expectancies. EA girls were more likely than AA girls to endorse a positive attitude toward alcohol use and intention to use. EA girls also had higher scores on positive expectancies than AA girls from ages 14 to 17, and on negative expectancies from ages 16 to 17. Table 3 presents year-by-year correlations between alcohol-related cognitions by race. With only a few exceptions, alcohol-related cognitions were significantly correlated across ages in both AA and EA girls. Overall, the strongest correlations were observed for positive and negative expectancies with intention to use in both groups, and between intention to use and positive attitude among EA girls.

Cross-lagged Panel Models

Autoregressive path coefficients—The adjusted autoregressive path coefficients from cross-lagged models conducted separately by race are shown in Table 4, with odds ratios reported for dichotomous endogenous variables. All autoregressive paths were significant in both subsamples, indicating consistent associations between prior year and subsequent year alcohol use and alcohol-related cognitions. Post-hoc comparisons revealed significant differences by race for only two paths: negative expectancies from ages 13–14 ($z=-3.56$; FDR adjusted $p=0.01$) and positive expectancies from age 16–17 ($z=-3.51$; FDR adjusted $p=0.01$), with stronger associations in EA than AA girls.

Cross-lagged path coefficients: from cognitions to alcohol use—As seen in Table 5, intention to use alcohol significantly predicted subsequent year alcohol use consistently over time in both AA and EA girls (odds ratios [ORs] ranged from 1.55–2.71). By contrast, positive attitude toward alcohol use did not predict subsequent year use at any age in either racial group. Significant associations between positive expectancies and subsequent use were limited to the age 12–13 lag in EA girls (OR=1.31, CI: 1.05–1.64) and the age 15–16 lag in AA girls (OR=1.33, CI: 1.13–1.57). Negative expectancies did not predict subsequent year use at any age among AA girls, but significant associations between negative expectancies and subsequent year use were found at ages 12–13 and 14–15 in EA girls (OR=1.59, CI:1.25–2.02 and OR=1.41, CI:1.15–1.74, respectively).

Cross-lagged path coefficients: from alcohol use to cognitions—As seen in Table 5, among EA girls, past year alcohol use was positively associated with all subsequent year alcohol-related cognitions across ages, with only one exception (positive expectancies at ages 12–13). A very similar pattern emerged from models conducted with the AA

subsample. Specifically, alcohol use predicted subsequent year negative expectancies across ages 12–17 (betas ranged from 0.15 to 0.18), positive expectancies and intention to use from the age 14–15 lag onward (betas ranged from 0.15 to 0.21), and positive attitude toward use for ages 13–14, 14–15, and 15–16 (ORs ranged from 1.80 to 3.93). Although patterns of results suggested a later emergence of associations between alcohol use and positive expectancies, positive attitude, and intention to use in AA versus EA girls, post-hoc tests did not reveal statistically significant racial differences in any cross-lagged paths.

Reciprocal associations between alcohol-related cognitions and use

Bidirectional effects, i.e., statistically significant paths from alcohol cognitions to use, and from use to cognitions, were evident for intention to use alcohol across ages in EA girls and for ages 14 onward in AA girls. Bidirectional associations were also observed for negative expectancies at ages 12–13 and 14–15 in EA girls and for positive expectancies at ages 15–16 in AA girls.

Discussion

The present work builds on existing literature on the relationship between alcohol-related cognitions and adolescent alcohol use, which to date has primarily focused on the examination of cognitions as predictors of use and been largely limited to samples of predominantly European ancestry (e.g., Antin et al., 2014; Christiansen et al., 1989; Maddahian et al., 1988). Our study expands on the current body of research in several important ways. By including a large proportion of AA girls, we were able to characterize associations between alcohol-related cognitions and use in both AA and EA girls. Further, by examining multiple cognitions in combination, we identified intention to drink as the alcohol-related cognition with the most consistent association – across adolescence and across race – with alcohol use. Additionally, by modeling the associations between alcohol use and subsequent cognitions in addition to the more commonly studied associations between cognitions and subsequent use, we identified reciprocal effects specific to intention to drink in both AA and EA girls.

Consistent with existing literature (Chartier et al., 2009; Chung et al., 2008; Rinehart et al., 2006), increases in endorsement of cognitions and use over time were observed in both racial groups. Also in keeping with prior studies, at most time points, endorsement of cognitions (Antin et al., 2014; Chartier et al., 2009; Randolph et al., 2009; Slutske et al., 2002) and prevalence of alcohol use (Chartier et al., 2009; Chung et al., 2014) were higher in EA than AA girls, with a notable divergence between the two groups around age 14 with respect to positive expectancies and attitude, likely reflecting the emergence of alcohol use in EA girls. This suggests that, in addition to consuming alcohol at an earlier age relative to AA girls, EA girls may also be forming perspectives on alcohol earlier and to a larger extent. Of greatest relevance to our study, although rates of endorsement of use and cognitions were significantly higher in EA girls, we did not find support for our hypothesis that the magnitude of association between cognitions and alcohol use would be greater in EA than AA girls. That is, racial differences in prevalence of alcohol use and endorsement of alcohol-related cognitions did not translate into racial differences in the link between cognitions and

use. Thus, it does not appear that the lower prevalence of alcohol use in AA versus EA girls can be attributed to distinctions in the associations between use and cognitions (as measured in this study).

Previous work has evinced bidirectional relationships between some cognitions and alcohol use, namely positive expectancies (Aas et al., 1998, Bauman et al., 1985, Jester et al., 2015) and intention to drink (Payne et al., 2016). Based on these findings, we expected reciprocal relationships with alcohol use to emerge for positive expectancies and intention to drink and to extend to a broader set of cognitions, namely, positive attitude and negative expectancies. The present findings partially supported this hypothesis in that reciprocal relationships emerged for intention to drink. However, we did not find reciprocal effects for positive attitude toward alcohol use, and reciprocal associations of alcohol use with positive and negative expectancies were inconsistent. These results contrast with two prior studies that found reciprocal effects for positive expectancies, specifically, social facilitation expectancies (Aas et al., 1998; Jester et al., 2015). One possible reason for this inconsistency in results across studies may be due to cultural differences in drinking practices associated with living in Norway (Aas et al., 1998) compared to the United States. Another possible explanation for mixed findings may be due to one study's use of a high risk sample (Jester et al., 2015), composed of sons and daughters of alcoholic men, who are likely to develop alcohol-related expectancies at an earlier age due to exposure to parental alcohol use. It is possible as well that the use of different alcohol expectancy measures contributed to the mixed findings.

Previous longitudinal work has demonstrated significant associations between alcohol-related attitudes and subsequent use (Donovan and Molina, 2014), and between expectancies and subsequent use (Aas et al., 1998; Bauman et al., 1985; Fisher et al., 2007; Jester et al., 2015). We were somewhat surprised that we did not observe similar patterns in our sample, with the exception of a single positive expectancies pathway each for the AA and EA subsamples. The associations between negative expectancies and increased likelihood of alcohol use at ages 12–13 and 14–15 in the EA subsample are challenging to interpret, given that they are not part of a larger trend. The age 12–13 association in particular should be interpreted with caution, as reliability of the negative expectancies measure was lowest at age 12. Overall, distinctions between our findings and those of prior studies may be attributable to differences in sampling as well as the operationalization of the alcohol-related cognitions. For example, Donovan and Molina (2014) examined very specific attitudes, i.e., toward tasting someone else's drink or sipping during a family dinner, measured at 8 to 10 years of age, as a predictor of sipping by age 12. Thus, their results are most relevant to understanding primarily within-family, parent-sanctioned use of alcohol prior to adolescence. Additionally, the use of cohorts with age ranges that cross developmental periods, such as (Fisher et al.'s study (2007) in which participants ranged in age from 11 to 18 at baseline, may lead to different results than the year-by-year examination of attitudes toward alcohol use we conducted; significant associations could potentially be driven by the older adolescents, who are closer to the peak period of risk for initiation. Previous studies based on comparably aged samples have also used a higher threshold for alcohol consumption (Aas et al., 1998; Fisher et al., 2007), than our measure of any alcohol use in the past year, which included sips. In fact, in Jester et al.'s study (2015), significant

associations with expectancies were observed for first intoxication and onset of binge drinking but not first drink, suggesting that the association between alcohol related cognitions and drinking behaviors emerges at higher levels of alcohol involvement.

The present results showed that intention to use alcohol predicted subsequent year use for both EA and AA girls, at ages 12 to 17. Our findings are consistent with the broader literature, in which these links have been found for 5th graders (Andrews et al., 2008; Webb et al., 1996) as well as pre- to early adolescents (Maddahian et al., 1988; Payne et al., 2016). Furthermore, they are aligned with a prior investigation including a substantial number of AA youth, which also observed associations between intention to drink and subsequent alcohol use across race (Maddahian et al., 1988). Given that attitudes and expectancies relate to the way someone thinks about alcohol, which is less proximal to alcohol use as intention to drink, it is not surprising that intention to use is the strongest and most consistent predictor of alcohol use, and that use reinforces intention (Payne et al., 2016). In the current study, whereas the coefficients for the pathways from expectancies and attitude to subsequent year alcohol were not significant in the multivariate models, significant associations were observed in bivariate models (not shown). This suggests that the relatively weak results for expectancies and attitude as predictors of use are likely attributable to the overlapping variance with intentions measured at the same age. Although beyond the scope of the current study, the possibility that expectancies and attitudes are predictors of intention to drink - and thus, intentions are best viewed as intermediary cognitions along the pathway from expectancies and attitudes to alcohol use - merits exploration.

Limitations

Findings from the present study should be considered in the context of its limitations. First, the sample was recruited from an urban population, with oversampling of low income neighborhoods, and as such, findings may not generalize to non-urban or more affluent populations. Second, although retention over follow up was generally high, modest bias due to attrition over the follow-up period was observed. (EA girls were less likely to be followed, but the association of race with missingness was minimal, $r=.07$ and longitudinal analyses used methods that accommodated incomplete data). Third, due to the low level of alcohol use in early through mid-adolescence, alcohol use was coded dichotomously, so inferences cannot be made about alcohol-related cognitions in relation to frequency or quantity of use. Fourth, our use of a single item to assess positive attitude toward alcohol use likely did not capture the construct as well as would a multi-item measure. Fifth, although the reliability coefficients for negative expectancies for EA girls ranged from 0.66 to 0.77, the reliability coefficient of 0.58 for AA girls at age 12 suggests that reliability was somewhat limited for AA girls at that age. Sixth, we could not separate between- and within-person effects in our models, as these could not be tested simultaneously with reciprocal associations with respect to a dichotomous outcome. That is, we cannot distinguish between two possible interpretations of findings: (1) that girls with relatively high intentions are more likely than other girls in the population to use alcohol (between-person effects) and/or (2) that a given girl's intention to use is associated with her increased likelihood of subsequent alcohol use. Finally, in comparison to omnibus multi-group testing, which was not feasible in the present

analyses with MLR estimation, the use of single degree of freedom tests for each cross-lagged pathway limits the power to detect possible race differences.

Future Directions

Results from the current study indicate that adolescent girls who express the intention to use alcohol are highly likely to follow through. As intention to drink was a strong and consistent predictor of alcohol use in this sample, and alcohol use appears to reinforce subsequent intention to drink, it will be important to identify modifiable risk factors that contribute to intention to drink. Beyond expectancies and attitudes toward alcohol use, factors to consider include social norms (Rimal and Mollen, 2013) and perceptions of risks (Chen and Yang, 2015), as well as broader family and environmental factors (Nargiso et al., 2013). Another natural next step in this line of research is the investigation of alcohol-related cognitions and alcohol use in emerging adulthood, which will provide critical information about the role of cognitions in risk for heavy drinking. Toward the larger goal of identifying sources of variation in drinking behaviors between AA vs. EA youth, investigations of other alcohol-related risk and protective factors known to differ by race, including religious involvement (Wallace et al., 2007), are underway.

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Figure 1.
Cross-lagged panel model of alcohol-related cognitions and alcohol use from ages 12 to 17

Table 1

Demographic and psychosocial characteristics at age 12 by race

	AA girls n=1235	EA girls n=938	Test statistic
Primary caregiver education <12 years education	51.41%	38.72%	$\chi^2_{(1)} = 33.50^{***}$
Household receipt of public assistance assistance	52.20%	16.48%	$\chi^2_{(1)} = 282.92^{***}$
Single parent headed household	60.78%	21.46%	$\chi^2_{(1)} = 323.83^{***}$
Early puberty (menses by age 11)	36.19%	17.09%	$\chi^2_{(1)} = 94.63^{***}$
Conduct problems: Mean (SD)	1.26 (1.93)	0.68 (1.36)	$t = -7.62^{***}$

 $p < .001$.

AA=African American EA=European American

Table 2

Year-by-year alcohol-related cognitions and prevalence of use by race

African American girls						
	12	13	14	15	16	17
Mean (SD)						
Positive Expectancies	0.78 (1.01)	0.88 (1.02)	1.00 (1.00)**	1.12 (1.00)**	1.15 (0.99)**	1.21 (1.02)**
Negative Expectancies	1.32 (0.81)	1.38 (0.84)	1.56 (0.85)	1.65 (0.86)	1.73 (0.91)*	1.89 (0.97)*
Intention to Use	1.16 (0.46)	1.30 (0.62)*	1.46 (0.73)***	1.58 (0.80)***	1.71 (0.87)***	1.85 (0.95)***
Proportion endorsed						
Positive attitude	2.01%	3.37%	3.85%***	5.54%***	6.12%***	9.98%***
Alcohol use	8.96%***	12.31%***	15.33%***	21.19%***	25.62%***	31.07%***
European American girls						
	12	13	14	15	16	17
Mean (SD)						
Positive Expectancies	0.71 (0.87)	0.82 (0.86)	1.12 (0.92)	1.25 (0.91)	1.3 (0.89)	1.34 (0.88)
Negative Expectancies	1.25 (0.82)	1.38 (0.89)	1.54 (0.92)	1.67 (0.93)	1.82 (0.91)	2.00 (0.95)
Intention to Use	1.19 (0.52)	1.37 (0.70)	1.66 (0.87)	1.84 (0.95)	2.00 (1.02)	2.24 (1.07)
Proportion endorsed						
Positive Attitude	1.35%	3.67%	9.29%	12.87%	16.67%	24.75%
Alcohol use	15.38%	21.01%	31.41%	37.38%	43.62%	53.12%

* Differs from EA girls at $p < .05$;** Differs from EA girls at $p < .01$;*** Differs from EA girls at $p < .001$.

Table 3

Year-by-year correlations among alcohol-related cognitions by race

African American girls						
	12	13	14	15	16	17
Positive Expectancies – Negative Expectancies	-.22***	-.17***	-.15***	-.13***	-.07*	-.14***
Positive Expectancies – Intentions	.07*	.19***	.24***	.30***	.30***	.30***
Positive Expectancies – Positive Attitudes	.07*	.03	.12***	.13***	.10**	.06
Negative Expectancies – Intentions	.20***	.29***	.27***	.31***	.38***	.36***
Negative Expectancies – Positive Attitudes	.04	.21***	.10**	.11***	.11***	.14***
Intentions – Positive Attitudes	.03	.20***	.24***	.24***	.14***	.17***
European American girls						
	12	13	14	15	16	17
Positive Expectancies – Negative Expectancies	-.16***	-.01	.03	.12***	.10**	.09*
Positive Expectancies – Intentions	.17***	.23***	.36***	.42***	.47***	.43***
Positive Expectancies – Positive Attitudes	.08*	.09**	.18***	.17***	.25***	.26***
Negative Expectancies – Intentions	.34***	.45***	.48***	.49***	.48***	.51***
Negative Expectancies – Positive Attitudes	.14***	.22***	.30***	.33***	.30***	.33***
Intentions – Positive Attitudes	.20**	.35***	.43***	.38***	.41***	.42***

* p<.05;

**

p<.01;

p<.001

Table 4

Adjusted autoregressive path coefficients from cross-lagged models conducted separately by race

	African American (AA)		European American (EA)		AA vs EA z	FDR adj p-value
	beta	95% CI	beta	95% CI		
Alcohol Use						
12 → 13 (OR)	3.50***	2.00	6.13	4.46***	2.68	7.42
13 → 14 (OR)	3.26***	2.04	5.20	2.96***	1.92	4.57
14 → 15 (OR)	3.49***	2.29	5.34	1.89**	1.23	2.90
15 → 16 (OR)	3.83***	2.60	5.65	2.34***	1.53	3.58
16 → 17 (OR)	2.76***	1.91	3.99	1.97**	1.28	3.03
Positive expectancies						
12 → 13	0.25***	0.19	0.31	0.36***	0.28	0.43
13 → 14	0.34***	0.28	0.39	0.38***	0.30	0.45
14 → 15	0.32***	0.26	0.38	0.37***	0.30	0.44
15 → 16	0.32***	0.26	0.38	0.45***	0.39	0.52
16 → 17	0.34***	0.28	0.40	0.50***	0.43	0.56
Negative expectancies						
12 → 13	0.31***	0.25	0.37	0.42***	0.35	0.49
13 → 14	0.32***	0.27	0.38	0.48***	0.42	0.53
14 → 15	0.41***	0.36	0.47	0.44***	0.37	0.51
15 → 16	0.43***	0.37	0.49	0.44***	0.37	0.51
16 → 17	0.45***	0.39	0.51	0.55***	0.49	0.61
Positive attitude						
12 → 13 (OR)	10.89***	4.01	29.59	12.74***	2.90	55.97
13 → 14 (OR)	6.5***	2.77	15.28	6.44***	2.78	14.92
14 → 15 (OR)	3.87**	1.66	8.98	3.96***	2.23	7.01
15 → 16 (OR)	4.20***	2.08	8.47	2.66***	1.63	4.34
					1.05	0.74

	African American (AA)		European American (EA)		AA vs EA z	FDR adj p-value
	beta	95% CI	Lower Bound	Upper Bound		
16 → 17 (OR)	3.76***	2.08	6.81	4.80	0.50	0.89
Intentions to use						
12 → 13	0.38***	0.28	0.49	0.56	-0.39	0.91
13 → 14	0.43***	0.35	0.52	0.47	0.91	0.77
14 → 15	0.40***	0.32	0.47	0.62	-2.75	0.08
15 → 16	0.40***	0.33	0.47	0.55	-1.34	0.62
16 → 17	0.36***	0.29	0.43	0.54	-1.89	0.25

*
p<.05;

**
p<.01;

p<.001;

AA=African American; EA=European American; CI=Confidence Interval; FDR=False Discovery Rate. Statistically significant differences in path coefficients between AA and EA participants are indicated by bold text. This table reports the results for two multivariate models (i.e., all 4 cognitions analyzed simultaneously), one for AA girls and one for EA girls. For each model, covariates included: household receipt of public assistance, single parent household status, primary caregiver education level, early puberty, and severity of conduct problems. Unstandardized regression coefficients are reported except where indicated otherwise.

Table 5

Adjusted cross-lagged path coefficients from cross-lagged models conducted separately by race

Predicting Alcohol Use (OR)				Predicting from Alcohol Use			
AA girls		EA girls		AA vs. EA girls		EA girls	
OR	95% CI	OR	95% CI	z (FDR adj p-value)	beta	95% CI	beta
Positive expectancies							
12 → 13	1.18	(0.99,1.39)	1.31 [*]	(1.05,1.64)	-0.77 (p=0.82)	0.15	(-0.04,0.34)
13 → 14	1.18	(1.00,1.38)	1.11	(0.90,1.36)	0.46 (p=0.89)	0.11	(-0.06,0.27)
14 → 15	1.12	(0.94,1.33)	1.18	(0.98,1.41)	-0.38 (p=0.91)	0.21 [*]	(0.05,0.36)
15 → 16	1.33 ^{***}	(1.13,1.57)	0.95	(0.77,1.18)	2.45 (p=0.13)	0.15 [*]	(0.02,0.28)
16 → 17	1.02	(0.87,1.19)	1.04	(0.84,1.29)	-0.19 (p=0.94)	0.19 ^{**}	(0.06,0.33)
Negative expectancies							
12 → 13	1.25	(0.98,1.59)	1.59 ^{***}	(1.25,2.02)	-1.40 (p=0.59)	0.18 [*]	(0.00,0.36)
13 → 14	1.13	(0.90,1.41)	1.21	(0.98,1.49)	-0.47 (p=0.89)	0.16 [*]	(0.01,0.30)
14 → 15	1.21	(0.99,1.48)	1.41 ^{**}	(1.15,1.74)	-1.06 (p=0.74)	0.15 [*]	(0.02,0.28)
15 → 16	1.11	(0.92,1.33)	1.16	(0.94,1.43)	-0.33 (p=0.91)	0.18 ^{**}	(0.06,0.31)
16 → 17	1.08	(0.90,1.29)	1.1	(0.88,1.37)	-0.14 (p=0.94)	0.18 ^{**}	(0.06,0.31)
Positive attitude							
12 → 13	0.45	(0.10,1.95)	1.42	(0.22,8.97)	-0.96 (p=0.77)	OR=62	(0.15,2.54)
13 → 14	0.89	(0.38,2.10)	1.76	(0.71,4.36)	-1.07 (p=0.74)	OR=3.93 ^{***}	(2.07,7.48)
14 → 15	0.81	(0.37,1.79)	0.84	(0.44,1.62)	-0.06 (p=0.98)	OR=3.28 ^{***}	(1.80,5.99)
15 → 16	0.72	(0.34,1.51)	1.35	(0.75,2.43)	-1.31 (p=0.62)	OR=1.8 [*]	(1.06,3.05)
16 → 17	1.44	(0.80,2.59)	1.35	(0.77,2.38)	0.15 (p=0.94)	OR=1.45	(0.94,2.24)
Intentions to use							
12 → 13	1.77 ^{**}	(1.21,2.60)	1.55 [*]	(1.04,2.32)	0.47 (p=0.89)	0.16	(-0.03,0.35)
13 → 14	1.86 ^{***}	(1.42,2.44)	1.87 ^{***}	(1.39,2.52)	-0.04 (p=0.98)	0.11	(-0.05,0.28)
14 → 15	1.72 ^{***}	(1.35,2.18)	2.18 ^{***}	(1.65,2.88)	-1.28 (p=0.62)	0.24 ^{**}	(0.09,0.39)
15 → 16	1.65 ^{***}	(1.31,2.08)	2.71 ^{***}	(2.06,3.57)	-2.70 (p=0.08)	0.27 ^{***}	(0.13,0.41)

		Predicting Alcohol Use (OR)				Predicting from Alcohol Use				AA vs EA girls	
		AA girls	EA girls	OR	95% CI	95% CI	z (FDR adj p-value)	beta	95% CI	beta	95% CI
16 -> 17	1.85 ^{***}	(1.50,2.28)	2.51 ^{***}	(1.93,3.27)	-1.80 (p=0.29)	0.34 ^{***}	(0.19,0.49)	0.36 ^{***}	(0.17,0.54)	-0.14 (p=0.94)	

[†] p=0.05;

* p<.05;

** p<.01;

*** p<.001;

AA=African American; EA=European American; CI=Confidence Interval; FDR=False Discovery Rate. Statistically significant differences in path coefficients between AA and EA participants are indicated by bold text. This table reports the results for two multivariate models (i.e., all 4 cognitions analyzed simultaneously), one for AA girls and one for EA girls. For each model, covariates included: household receipt of public assistance, single parent household status, primary caregiver education level, early puberty, and severity of conduct problems. Unstandardized regression coefficients are reported except where indicated otherwise.