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Longitudinal Associations of Alcohol Involvement with Subjective Well-Being in Adolescence and Prediction to Alcohol Problems in Early Adulthood

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Abstract

Adolescent alcohol involvement is associated with numerous negative outcomes, but also appears to have positive correlates, including subjective well-being. Additional research is needed to understand these paradoxical findings. The current study examines alcohol use, adverse alcohol-related (and other substance-related) consequences, and subjective well being in adolescence, and prediction to problem alcohol use in early adulthood. Participants in this longitudinal study, which extended from age 11 to age 21, were 208 rural teens (109 girls) and their families. Covariates included early substance use, early conduct problems, early depressed mood, gender, and parent educational attainment. Structural equation modeling showed that subjective well-being at age 16 positively predicted increased alcohol use at age 18. Alcohol use was not a significant predictor of subjective well-being; however, alcohol use at age 18 positively predicted alcohol problems at age 21, even while controlling for earlier adverse consequences and other predictors. Results help to further elucidate both the negative and positive correlates of underage drinking, and support the value of delaying alcohol initiation.

Keywords

alcohol use; subjective well-being; longitudinal; adolescence; early adulthood

Adolescent alcohol use rates have been declining in the United States in recent years, but remain elevated. Among 12th Grade students in 2009, 71% reported having ever used alcohol and 54% reported having ever been drunk (Johnston, O'Malley, Bachman, & Schulenberg, 2010). Adolescent alcohol use is associated with a range of negative psychosocial and behavioral outcomes, including mental health problems and school difficulties (Newcomb & Bentler, 1988a; Spoth, Greenberg, & Turrisi, 2008). Moreover, alcohol use can disrupt processes related to brain development (Brown, Tapert, Granholm, & Delis, 2000), which are ongoing throughout the teen years (Spear, 2000). Alcohol often plays a role in the three most common forms of mortality among young people (Spoth et al., 2008), including homicides, suicides, and accidents. The adverse consequences of adolescent alcohol use are not confined to the teen years, but extend into early adulthood (Newcomb & Bentler, 1988a). In particular, underage drinking has been shown to increase adolescents' risk for the development of problem drinking and alcohol use disorders as

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young adults (Guo, Collins, Hill, & Hawkins, 2000; Mason et al., 2010; Hingson, Heeren, & Winter, 2006). Due to the widespread patterns of adolescent alcohol use and associated adverse short-term and long-term outcomes, underage drinking is a serious public health concern.

Paradoxically, alcohol use also appears to have a number of positive correlates among adolescents. For example, drinking has been shown to be associated positively with academic performance, psychosocial competence, and social acceptance (Maggs, Patrick, & Feinstein, 2008; Newcomb & Bentler, 1988b; Shedler & Block, 1990), and to predict increased earning potential (Chatterji & DeSimone, 2006). Research in this area is less well developed than that examining adolescent alcohol risks and, with some exceptions (e.g., Maggs et al., 2008), has been based primarily on cross-sectional or short-term longitudinal follow-up data. However, these findings are consistent with research documenting the potential physical and mental health benefits of moderate alcohol use in the general population of adults (McFarlane et al., 2009; Mukamal et al., 2003). Of course, heavier drinking increases the likelihood of adverse alcohol-related consequences among teens (Colder, Campbell, Ruel, Richardson, & Flay, 2002). Still, research suggests that certain benefits of alcohol consumption may be realized even at higher levels of use among college-age students (Park, 2004), and possibly among adolescents (e.g., Chatterji & DeSimone, 2006).

A full understanding of the development of adolescent alcohol use should account for these paradoxical findings, yet relatively few studies have systematically examined risks as well as potential benefits of alcohol use among young people. There are, of course, exceptions to this trend (as described above), including a recent analysis conducted by Molnar, Busseri, Perrier, and Sadava (2009). Drawing from Sadava's (1985) two-factor theory, Molnar and colleagues examined longitudinal associations of alcohol use and adverse alcohol-related consequences with subjective well-being in a sample of first-year university students attending a public university in Ontario, Canada. In two-wave structural equation modeling (SEM) analyses, they found an expected positive correlation between alcohol use and adverse consequences at Time 1. Time 1 alcohol use predicted increased subjective well-being at Time 2, controlling for adverse consequences. By contrast, Time 1 adverse consequences predicted decreased subjective well-being at Time 2, controlling for alcohol use. As noted by these authors, subjective well-being (Diener, 1984) represents a global assessment of functioning that reflects certain individual perceptions and feelings that have been linked with alcohol consumption, including life satisfaction (Murphy, McDevitt-Murphy, & Barnett, 2005; Newcomb, Bentler, & Collins, 1986) as well as positive and negative affect (Wills, Sandy, Shinar, & Yaeger, 1999).

The Molnar et al. (2009) study is part of a growing literature that documents the multidimensional nature of alcohol involvement (Auerbach & Collins, 2006; Stice, Barrera, & Chassin, 1998), and differential prediction of alcohol dimensions to outcomes in multivariate analyses (Mason et al., 2008). Relatively few studies have considered alcohol involvement in relation to subjective well-being among young people. Those that exist typically have examined either alcohol use or alcohol-related consequences as predictors of specific indicators of subjective well-being (Bogart, Collins, Ellickson, & Klein, 2006; Murphy et al., 2005; Newcomb et al., 1986; Zullig, Valois, Huebner, Oeltmann, & Drane, 2001), with mixed findings. For example, some studies have reported negative associations of drinking with life satisfaction (e.g., Zullig et al., 2001); a few have provided some evidence for enhanced life satisfaction associated with alcohol use (Murphy et al., 2005); and Bogart and colleagues (2006) found that cigarette and hard drug use, but not alcohol use, in adolescence predicted lower life satisfaction in adulthood. Mixed findings likely are

due in part to variations in study design and sample characteristics, and particularly to differences in the measurement and analysis of alcohol involvement.

Molnar and colleagues (2009) were the first to examine simultaneously, within a multivariate context, the links between two different dimensions of alcohol involvement and subjective well-being in a sample of college students. Additional work is needed. Toward this end, the current analysis extends prior research by analyzing data collected from a sample of rural teens followed over time to examine associations of alcohol use and adverse substance use consequences (hereafter referred to as adverse consequences) with subjective well-being during adolescence, and prediction to alcohol problems in early adulthood.

In this study, which draws on control condition data from an ongoing longitudinal prevention trial (Spoth, Trudeau, Guyll, Shin, & Redmond, 2009), participating teens followed many different pathways into adulthood; therefore, the sample provides a benefit in representing a diversity of young adult roles and not being restricted to college attendees. Moreover, little developmental research has been conducted on adolescent alcohol use in rural settings, yet findings from national surveys indicate that drinking rates are higher among rural youth compared to their urban and suburban counterparts (Gfroerer, Larson, & Colliver, 2007; Lambert, Gale, & Hartley, 2008). Rural adolescents typically have fewer structured educational and recreational opportunities and are more geographically isolated than non-rural adolescents (D'Onofrio, 1997). These factors may contribute to greater amounts of time available for unsupervised problem behaviors, including underage drinking. Because poverty, stress, and depression are prevalent in rural areas and have negative associations with indicators of subjective well-being (Conger et al., 1991; Gibbons, Wylie, Echterling, & French, 1986), rural youth may be particularly likely to use alcohol as an attempt to cope with problems or boost perceived well-being.

Due to the developmental changes that unfold during adolescence (e.g., executive control, self-reflection, planning; Windle et al., 2008), alcohol use and subjective well-being likely are continuing to develop throughout the teen years, whereas they may be more established by early adulthood. For example, alcohol onset and escalation of use typically occur during adolescence (Windle et al., 2008), though patterns of use continue to change throughout early adulthood (Spoth et al., 2009). The current study helps to address the question of whether predictive relationships among alcohol use, adverse consequences, and subjective well-being that have been observed during the young adult years operate in a similar or different manner during the teen years.

Hypotheses

It was expected that alcohol use and adverse consequences in adolescence would be distinct but positively correlated constructs (Stice et al., 1998), with differential patterns of prediction to subjective well-being (cf. Mason et al., 2008). Although prior research often has tested the hypothesis of a negative association between adolescent alcohol use and subsequent indicators of well-being, such as life satisfaction (Bogart et al., 2006), findings are mixed and analyses typically have not accounted for adverse consequences. Here, positive predictive associations between alcohol use and subjective well-being in adolescence were expected after controlling for the influence of adolescent adverse consequences in a multivariate SEM analysis. Specifically, it was hypothesized that earlier teen alcohol use would predict increased, whereas earlier adverse consequences would predict decreased, teen subjective well being (Molnar et al., 2009). The hypothesis that earlier subjective well-being would predict increased alcohol use also was tested, based on research that has identified indicators of subjective well-being (Crum, Storr, Ialongo, &

Anthony, 2008; Wills et al., 1999), as predictors of drinking among teens (e.g., Hawkins, Catalano, & Miller, 1992).

As noted, underage drinking can have lasting consequences throughout adolescence and into early adulthood (Newcomb & Bentler, 1988a), possibly due to disrupted brain maturation processes and/or other adverse developmental effects of alcohol consumption (Brown et al., 2000). The current analysis examines adolescent alcohol use, adverse consequences, and subjective well-being in relationship to young adult problem drinking. Despite hypothesized positive associations between alcohol use and subjective well-being during adolescence (Molnar et al., 2009), the former was still expected to positively predict problem drinking in early adulthood (Mason et al., 2010), even after controlling for earlier adverse consequences.

Finally, analyses included controls for several early adolescent influences on subsequent alcohol involvement, subjective well-being, and problem drinking, including early substance use, early conduct problems, early depressed mood, and gender. Early alcohol and other substance use initiation increases risk for the development of problem drinking and alcohol use disorders (Hingson et al., 2006). For example, Mason et al. (2010) found that alcohol use at age 10 positively predicted alcohol use disorders at ages 21 and 24 through higher levels of adolescent alcohol use in a sample of urban youth. Research further indicates that both early conduct problems (Mason, Hitchings, & Spoth, 2007; Stice et al., 1998; Windle, 1990) and early depressed mood (Crum et al., 2008; Mason et al., 2007) are prevalent problems that increase risk for subsequent adolescent alcohol involvement, prompting Brown and her colleagues (2000, p. S299) to note that developmental analyses of alcohol effects need to control for these comorbidities. Although rates of alcohol initiation and use in adolescence are comparable for boys and girls (Johnston et al., 2010), rates of heavy drinking and adverse consequences tend to be higher among males, particularly in late adolescence and early adulthood (e.g., Ellickson, Tucker, Klein, & McGuigan, 2001). Thus, gender was included as a covariate in the analyses. Gender moderation of the hypothesized longitudinal relationships under investigation also was explored. Finally, because it has been shown to be associated with attrition in the current longitudinal study, a measure of parent educational attainment also was included as a covariate.

Method

Data Set

Analyses were based on data collected from 208 control participants of Project Family, a seven-wave longitudinal prevention trial. Due to previously reported intervention effects on targeted young adult substance use outcomes (Spoth et al., 2009), including problem drinking, control-only analyses were conducted. Sixth-grade students enrolled in 11 rural schools located in the Midwestern United States were invited to participate with their families in the fall of 1993. About half (51%) of the invited families completed the Wave 1 assessment. The representativeness of the sample on family demographic and psychosocial characteristics has been confirmed through analyses of data from a prospective participation factor survey with a 90% participation rate; only parent educational attainment was significantly associated with participation (Spoth, Redmond, & Shin, 1997). Initially, the average age of children was 11.34 years. Fifty-two percent (n = 109) of target children were girls, and most of the participants were White (> 95%).

With covariates measured at Wave 1 (age 11; n = 208), analyses were based on data collected at Wave 5 (age 16; n = 151), Wave 6 (age 18; n = 157), and Wave 7 (age 21; n = 161). At the outset of the study, minimal assessments of alcohol use were included in the survey questionnaires. As the sample reached middle adolescence, assessments were

expanded to include broader measures of alcohol use and adverse consequences. This expansion corresponded with increasing initiation and escalation of alcohol use in the sample over time. Moreover, because alcohol use and problem drinking continue to escalate into young adulthood, richer assessments of alcohol-related problems were included in survey questionnaires administered to young adults at Wave 7.

Attrition comparisons have revealed few differences between dropouts and completers; however, more highly educated parents were more likely to stay in the study than less highly educated parents (Spoth, Redmond, & Shin, 1998). All study procedures, including parent consent and adolescent assent protocols, which have been described in detail elsewhere (Spoth et al., 2009), were approved by the Human Subjects Review committees at Iowa State University and the University of Washington.

Measures

Alcohol use (ages 16 and 18)—Alcohol use at Waves 5 and 6 was a latent variable with three indicators. First, teens reported the number of times they had consumed beer, wine, wine coolers, or other liquor within the past month. They also indicated their quantity of alcohol consumption by responding to the question “About how much (if at all) do you usually drink each time you drink?” on a scale ranging from (0) “I don’t drink alcohol” to (5) “More than 6 drinks.” Responses to these two items were standardized and summed to compute a *quantity-frequency index*. Second, teens were asked to indicate “During the past month, how many times have you had three or more drinks (beer, wine, or other liquor) in a row?” as a measure of *heavy episodic drinking*. To normalize the distribution, responses were categorized into (0) = “0”, (1) = “1,” and (2) = “2 or more.” Finally, teens indicated how many times in the past month they had been *drunk* from drinking beer, wine, wine coolers or other liquor. Responses were recoded into the three categories described above.

Adverse consequences (age 16)—Adverse consequences due to alcohol (and other substances) was a manifest variable at Wave 5 derived from responses to four questionnaire items that asked teens to indicate how often their use of “alcohol, marijuana, or other drugs” caused them to behave in ways that they later regretted and hurt relationships with their parents, friends, and teachers ($\alpha = .84$). Response options ranged from (0) “never” to (3) “very often.” Although this item referred to multiple substances, alcohol is the most commonly used substance among the teens in this sample.

Subjective Well-Being (ages 16 and 18)—Subjective Well-Being at Waves 5 and 6 was a latent variable with three indicators. First, teens’ degree of *life satisfaction* (e.g., enjoying things, being happy, feeling relaxed) over the past month was assessed with responses to 6 questionnaire items on a scale ranging from (1) “All of the time” to (6) “None of the time.” Items were reverse coded and summed to compute a life satisfaction scale (average $\alpha = .89$). Second, teens completed the 10-item Rosenberg (1979) *self-esteem* scale, with response options ranging from (1) “Strongly disagree” to (5) “Strongly agree” (average $\alpha = .90$). Finally, *depressed mood* was the average of 8 items (e.g., unhappy, sad, or depressed) from the Child-Behavior Checklist-Youth Self-Report (Achenbach, 1991); average alpha reliability was .85. Note that depressed mood was allowed to load negatively on the subjective well-being factor in the SEM analyses.

Alcohol Problems (age 21)—Eight questions from a short, modified form of the Rutgers Alcohol Problems Index (White & Labouvie, 1989) assessed young adult alcohol problems in the past year (e.g., memory loss, trouble with the police). Response options ranged from (0) “Never” to (4) “Four or more times,” and were summed to compute an overall scale ($\alpha = .89$).

Covariates* (age 11)—Early substance use* was a dichotomous variable that indexed use (coded 1) or nonuse (coded 0) of any substance (e.g., alcohol, cigarettes, marijuana) at age 11. *Early conduct problems* (cf. Spoth, Redmond, & Shin, 2000) were measured with 6 self-report items (e.g., mean/cruel, got into fights) from the CBCL-YSR that were averaged to compute an overall scale ($\alpha = .72$). *Early depressed mood*, similar to the depressed mood indicator described above, was measured with 8 self-report items from the CBCL-YSR that were averaged to compute an overall scale ($\alpha = .76$). Due to its association with attrition from the study, a measure of *parent educational attainment* at Wave 1 (i.e., highest grade of schooling reported by both parents) was included in the analyses. *Gender* (coded 1 for males and 0 for females) also was a covariate. Correlations and descriptive statistics for the measures are presented in Table 1.

Analyses

The data were analyzed via SEM in Mplus 5.2 (Muthén & Muthén, 2009) using the Weighted Least Squares Means- and Variance-Adjusted (WLSMV) estimator, due to the categorical nature of some of the selected indicators. Model fit was evaluated using the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). School was specified as a clustering variable. Prior to analysis, adverse consequences, alcohol problems, early conduct problems, and early depressed mood were log transformed to help normalize their distributions. After transformation, skewness across all variables ranged from .03 to 3.5. Missing data procedures incorporated into Mplus resulted in a full analysis sample of 208 (control) cases.

Results

The SEM depicted in Figure 1 was estimated. Although not illustrated, all variables (excluding latent variable indicators) were regressed on the 5 covariates, which themselves were allowed to covary. Prior to the SEM, a confirmatory factor analysis (CFA) was conducted, in which the measurement model and all covariances among the 11 study constructs were estimated. Note that unstandardized factor loadings for the same indicator at the two waves were constrained to equality to ensure consistent measurement over time. In addition, per standard practice, covariances between the residuals of the same indicator over the two measurement occasions were estimated. According to current guidelines (e.g., a CFI of close to .95 or greater and an RMSEA of .06 or less; Hu & Bentler, 1999), the fit between the data and the CFA was acceptable, χ^2 (5, N = 208) = 6.09, p = .30, CFI = .99, RMSEA = .03. Standardized factor loadings ranged from .66 to .99. Estimated correlations among the constructs are reported in Table 2. In general, measures of alcohol use, adverse consequences, and problem alcohol use had statistically significant positive associations with one another, and statistically significant negative associations with subjective well-being.

Turning to the SEM, the fit between the data and the model in Figure 1 also was acceptable, χ^2 (5, N = 208) = 6.33, p = .28, CFI = .99, RMSEA = .04. Standardized path estimates are reported in the figure. Results showed that subjective well-being at age 16 had a statistically significant positive association with alcohol use at age 18, controlling for earlier alcohol use and adverse consequences (and the covariates). Neither alcohol use nor adverse consequences at age 16 was significantly related to subsequent subjective well-being; however, alcohol use at age 18 had a statistically significant positive association with alcohol problems at age 21, independent of the influences of earlier adverse consequences and the covariates.

Regarding the covariates, male gender was associated negatively with alcohol use ($\beta = -.21$, $p < .05$) and adverse consequences ($\beta = -.16$, $p < .05$) at age 16 and positively with alcohol

use at age 18 ($\beta = .20$, $p < .05$), which reflects the distribution of alcohol involvement over time across gender groups in this sample. Parent educational attainment was associated positively with subjective well-being at age 16 ($\beta = .16$, $p < .05$). Early alcohol use was a positive predictor of alcohol use ($\beta = .25$, $p < .05$) and adverse consequences ($\beta = .24$, $p < .05$) at age 16 and problem alcohol use at age 21 ($\beta = .21$, $p < .05$). Similarly, early conduct problems were associated positively with alcohol use at age 16 ($\beta = .17$, $p < .05$) and alcohol problems at age 21 ($\beta = .14$, $p < .05$). Interestingly, early depressed mood was associated negatively with alcohol use at age 16 ($\beta = -.24$, $p < .05$), but predicted increased alcohol use from age 16 to age 18 ($\beta = .20$, $p < .05$) in the multivariate model; it also was associated negatively with subjective well-being at age 16 ($\beta = -.22$, $p < .05$).

Finally, a series of multiple group SEMs was conducted to examine possible gender moderation of the longitudinal relationships under investigation. First, the SEM depicted in Figure 1 was estimated as an unconstrained model across gender groups; only the factor loadings of the latent variables were constrained to equality to establish consistent measurement for girls and boys. Next, all path coefficients among the measures of alcohol use, adverse consequences, subjective well-being, and alcohol problems were constrained to equality across the two groups. Results from a chi-square difference test using the difftest option in Mplus indicated that these constraints did not result in a statistically significant decrease in model fit when comparing the unconstrained and constrained models, χ^2 (4, N = 109,99) = 2.67, $p = .62$. This suggests that the longitudinal relationships were similar for boys and girls.

Discussion

The current study extends prior research (e.g., Bogart et al., 2006; Molnar et al., 2009; Murphy et al., 2005) by examining associations of alcohol use and adverse consequences with subjective well-being in adolescence, and links to alcohol problems in early adulthood. An important contribution is the examination of both negative and positive correlates of adolescent alcohol use (Chatterji & DeSimone, 2006; Maggs et al., 2008; Newcomb & Bentler, 1988b; Shedler & Block, 1990). Addressing such paradoxical findings is a prerequisite for fully understanding the development of underage drinking, which is a serious public health concern (Spoth et al., 2008). Underage drinking is particularly prevalent in rural areas of the United States (Gfroerer et al., 2007; Lambert et al., 2008), yet relatively little research has focused on rural youth. This study, therefore, helps fill important gaps in the literature.

It was hypothesized that alcohol use would predict increased subjective well-being, after controlling for earlier adverse consequences, based on findings reported by Molnar and colleagues (2009) in their study of first-year university students residing in an urban setting of Eastern Canada. However, our analyses showed that subjective well-being predicted increased alcohol use in a sample of rural teens from the Midwestern United States. Neither earlier alcohol use nor earlier adverse consequences significantly predicted subjective well-being.

Prior research typically has found either negative associations of alcohol use with indicators of subjective well-being (e.g., Zullig et al., 2001) or statistically non-significant associations (e.g., Bogart et al., 2006), but these studies rarely have accounted for multiple dimensions of alcohol involvement in multivariate analyses. Consistent with findings from a small but growing literature (e.g., Molnar et al., 2009), our results provide evidence for a positive association of alcohol use with subjective well-being when adjusting for adverse consequences. The specific pattern of findings is unique in this study. In contrast to the predictive results for college students reported by Molnar and colleagues (2009), the current

results suggest that subjective well-being positively predicts alcohol use among adolescents. Because underage drinking is predominantly a social activity (Mayer, Forster, Murray, & Wagenaar, 1998), alcohol initiation and escalation during adolescence may require a certain degree of social skills and networks that are held by those who have a high degree of subjective well-being. Additional research with expanded assessments (e.g., social skills measures) and alternative methods (e.g., social network analysis) is needed to further test this possible explanation for the findings.

It also is possible that adolescents with a high degree of perceived well-being are more likely to hold positive alcohol expectancies (e.g., relaxation, friendliness, sexual enhancement) and to drink for different reasons (e.g., to facilitate social interactions, to avoid boredom) than other adolescents. Alcohol expectancies tend to increase with age (e.g., Chung, Hipwell, Loeber, White, & Stouthamer-Loeber, 2008) and have been shown to predict alcohol consumption (Goldberg, Halpern-Felsher, & Millstein, 2002; Patrick, Wray-Lake, Finlay, & Maggs, 2009). Reasons for drinking may vary by region, and certain reasons, such as drinking with peers to avoid boredom, may be particularly salient for rural youth (D'Onofrio, 1997), thereby increasing the likelihood of adolescent alcohol use. Once established and within the context of college life, alcohol use may become a predictor of increased subjective well-being (Molnar et al., 2009), possibly through perceived continued enhancements to social activities. Expanded studies that address alcohol expectancies and reasons for drinking along with subjective well-being and other potential positive correlates of alcohol use are needed, especially those that focus on rural youth or directly compare urban and rural samples to determine the generalizability of findings.

Even after controlling for earlier adverse consequences as a distinct dimension of alcohol (and other substance) involvement (Sadava, 1985), alcohol use at age 18 was positively related to alcohol problems at age 21. Paradoxically, teen alcohol use has been shown to have both risks and benefits (Goldberg et al., 2002; Maggs et al., 2008). Still, research has documented a range of negative outcomes (Newcomb & Bentler, 1988a), including the development of problem drinking and alcohol use disorders (Hingson et al., 2006; Guo et al., 2000; Mason et al., 2010), that are associated with underage drinking. Our results suggest that it is not just the experience of adverse consequences in middle adolescence that portends problem drinking in early adulthood, but also the level and extent of alcohol use in late adolescence (Mason et al., 2010). It is possible that the neurological effects of alcohol disrupt brain maturation during a critical period of development among teens (Brown et al., 2000), and that these effects have lasting, if not permanent, consequences for functioning during the young adult years and beyond.

Several expected covariate effects were observed. For example, early alcohol and other substance involvement at age 11 was associated positively with subsequent adolescent alcohol use and adverse consequences, as well as with young adult problem drinking (Guo et al., 2000; Hingson et al., 2006; Mason et al., 2010). Interestingly, whereas early depressed mood was a negative predictor of alcohol use at age 16, it was a positive predictor of increased drinking from age 16 to age 18. Because alcohol use typically is a social activity among youth, it is possible that young adolescents who struggle with the symptoms of depression (e.g., inactivity, anhedonia) experience reduced risk for alcohol involvement in middle adolescence. Nevertheless, among those who do drink, depressed mood may lead to increased alcohol use over time, possibly as an attempt to cope with depressive symptomatology. These findings warrant further investigation.

Limitations

Findings are limited by the homogeneity of the sample; the reliance on self-reports; and the use of a broad, manifest measure of alcohol- and other drug-related consequences in

adolescence. Note that alcohol is the most commonly used substance in this sample of rural adolescents, and that the adverse consequences measure displayed predictive validity in its relationship to subsequent alcohol use and alcohol problems. Still, additional analyses with more diverse samples and richer assessments are needed. In particular, although this study helps fill the need for further research on adolescents in rural settings, the current analyses should be conducted with data collected from samples of urban and suburban teens to determine if the findings hold. Finally, gender moderation analyses can only be considered exploratory due to the small sample size.

Policy Implications and Conclusions

Findings support the value of delaying alcohol initiation among teens (Spoth et al., 2009), and suggest that prevention efforts may be bolstered by helping youth understand that, even in the face of potential benefits, underage drinking increases risk for subsequent alcohol problems. As noted by Goldberg et al. (2002), existing risk-focused prevention programs might be improved through the addition of content that promotes healthy alternative activities for achieving the social and personal benefits that some youth otherwise may seek through alcohol involvement. Given the relative lack of alcohol-related health services that are available in rural compared to urban and suburban contexts (National Advisory Committee on Rural Health and Human Services, 2007), such prevention efforts are particularly needed in rural areas.

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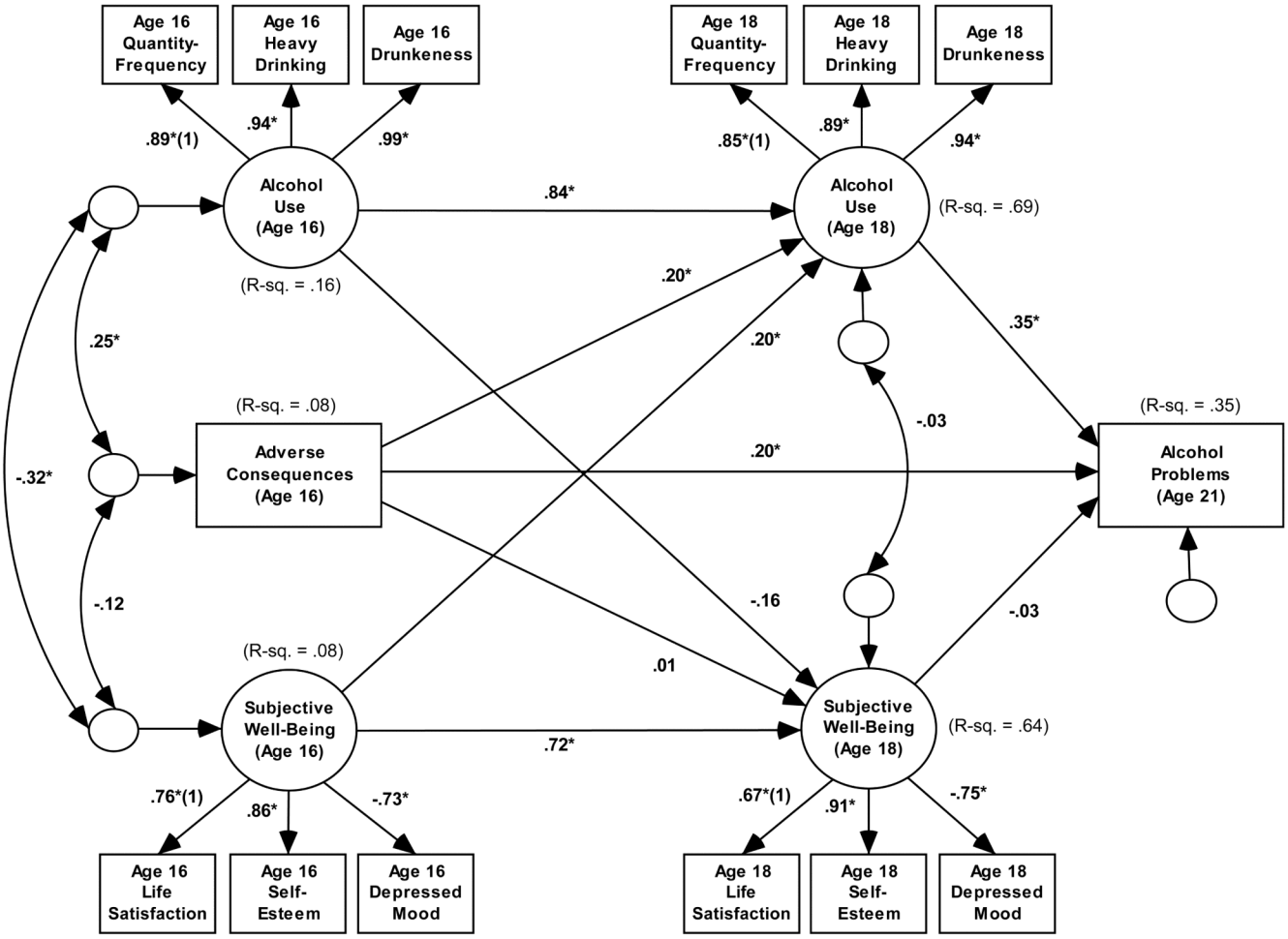

Figure 1.
Final Model Examining Associations of Adolescent Alcohol Use and Adverse Consequences with Subjective Well-Being, and Links to Young Adult Alcohol Problems. Note. * $p < .05$. (1) = reference indicator. Exogenous covariates measured at age 11 are not displayed, but include gender, parent educational attainment, early substance use, early conduct problems, and early depressed mood.

Table 1

Correlations, means, and standard deviations for the study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Gender (Male)																			
2. Parent education	−.01																		
3. Early substance use	.25*	.01																	
4. Early conduct problems	.16*	−.10	.29*																
5. Early dep. mood	−.12	−.05	.12	.47*															
6. Age 16 quan-freq	−.13	−.12	.20*	.12	−.06														
7. Age 16 heavy drink	−.06	−.11	.09	.02	−.11	.75*													
8. Age 16 drunkenness	−.09	−.16	.01	.07	−.09	.53*	.66*												
9. Age 18 quan-freq	.01	−.12	.18*	.10	.00	.56*	.42*	.31*											
10. Age 18 heavy drink	.02	−.11	.25*	.11	.02	.52*	.46*	.40*	.79*										
11. Age 18 drunkenness	.04	−.01	.25*	.14	.03	.50*	.47*	.43*	.64*	.64*									
12. Age 16 life satisf.	−.07	.16	−.06	−.15	−.19*	−.19*	−.15	−.10	−.05	−.08	−.06								
13. Age 16 self-esteem	.08	.16*	−.09	−.12	−.19*	−.27*	−.19*	−.14	−.10	−.05	−.10	.69*							
14. Age 16 dep. mood	−.28*	−.07	.03	.06	.16	.24*	.20*	.11	.09	.03	.08	−.48*	−.64*						
15. Age 18 life satisf.	−.01	.05	−.10	−.09	−.15	−.23*	−.26*	−.11	−.15	−.13	−.24*	.49*	.47*	−.32*					
16. Age 18 self-esteem	.08	.10	.01	−.08	−.23*	−.24*	−.20*	−.11	−.12	−.05	−.12	.54*	.67*	−.47*	.70*				
17. Age 18 dep. mood	−.24*	−.04	−.04	.03	.14	.27*	.27*	.28*	.06	.05	.20*	−.39*	−.56*	.57*	−.50*	−.64*			
18. Adverse consequences	−.11	.02	.31*	.02	−.05	.38*	.25*	.16	.32*	.29*	.40*	−.03	−.10	.13	−.12	−.12	.06		
19. Alcohol problems	.07	−.04	.11	.23*	.09	.35*	.32*	.25*	.38*	.37*	.47*	−.03	−.01	.07	−.17*	−.22*	−.12	.40*	
Mean	.48	13.4	.29	.13[a]	.21[a]	.11	.33	.13	.07	.67	.45	4.40	3.93	.30	4.35	4.08	.30	.74[a]	2.44[a]
Standard deviation	.50	1.61	.46	.23	.26	.91	.57	.42	.89	.84	.76	.88	.70	.39	.92	.61	.35	2.01	3.80

[a] prior to transformation;

* $p < .05$. Dep mood = depressed mood; Quan-Freq = quantity-frequency; Life satisf = life satisfaction.

Table 2

Estimated correlations among study constructs from the confirmatory factor analysis

Variables	1	2	3	4	5	6	7	8	9	10
1. Gender (male)										
2. Parent education	−.01									
3. Early substance use	.11	−.02								
4. Early conduct problems	.16	−.10	.16*							
5. Early depressed mood	−.12	−.05	.03	.47*						
6. Adverse consequences	−.11	.02	.23*	.02	−.05					
7. Alcohol use (age 16)	−.13	−.18	.25*	.08	−.12	.32*				
8. Alcohol use (age 18)	.03	−.12*	.09	.13*	.01	.37*	.76*			
9. SWB (age 16)	.03	.17*	−.08*	−.12	−.22*	−.13*	−.30*	−.12		
10. SWB (age 18)	.13	.09	−.07	−.08	−.22*	−.12	−.37*	−.19*	.79*	
11. Problem alcohol use	.07	−.04	.32*	.24*	.09	.40*	.37*	.47*	−.04	−.21*

Note. SWB = Subjective well-being;

* = $p < .05$.