ADOLESCENT PEER-RELATED SOCIAL STRESS AND VULNERABILITIES FOR UNDERAGE DRINKING

BY

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Submitted to the Clinical Child Psychology Program and the
Graduate Faculty of the University of Kansas
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy

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ABSTRACT

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Comprehensive models synthesizing contributors to alcohol use among mainstream adolescents are lacking in comparison to models more equipped to explain alcohol use among antisocial and delinquent adolescents. The present study examined a model of additive peer-related, emotional, and cognitive risk factors for adolescent alcohol use within a school-based sample of 10th grade adolescents. Participants provided self-reports of peer-related social stress, the discrepancy between their desired and perceived actual belonging within school peer crowds. Additionally, adolescents provided self-reports of self-esteem, coping, involuntary stress responses, sociability and tension reduction positive alcohol expectancies, and alcohol use. Adolescents who experienced higher levels of peer-related social stress and endorsed more sociability alcohol expectancies engaged in higher levels of alcohol use. Those who reported higher self-esteem were especially prone to drinking when faced with peer-related social stress. Implications for further model development and research directions, as well as school-based universal prevention programming, are discussed.

DEDICATIONS

This dissertation would not be complete without an expression of my utmost gratitude for those who have supported me in its completion and throughout my graduate career. I would like to thank my co-chairs, Drs. Eric Vernberg and Todd Little, for the energy and time they have invested in my graduate training, as well as for their guidance during the completion of my dissertation and with respect to my professional development. In keeping with a true scientist-practitioner model, Dr. Vernberg has instilled in me a desire to aim to conduct research that can make a difference for children, adolescents, and families. Dr. Little has with the gifts of his time and patience taught me so much about research methodology and quantitative analysis and supported me in applying what I have learned to the many projects on which he has worked with me during graduate school. I would also like to thank my graduate training director, Dr. Michael Roberts, for his devotion to developing such an exemplar training program in clinical child and adolescent psychology, and for the many opportunities and advice he has provided me. I am additionally thankful for the gentle prodding, patience, and support of Tammie Zordel, who helped me to navigate the logistics of completing the graduate program. Furthermore, I would like to thank my dissertation committee members for their constructive suggestions and my fellow graduate students for their friendship.

In addition to those who made my professional experience of graduate school so rich, I would like to express my deep appreciation for the love and support my family has provided to me during these years. My husband, Tim Nelson, has been not only an invaluable colleague but a tremendous source of encouragement. I am so grateful for his patience in listening to me think out loud about my research ideas and professional goals, as well as for his help in making editing suggestions for my written work. In addition he has continued to remind me of the importance of balancing career endeavors with enjoying life. I am also so thankful for my parents, John and Karen Mize. They have displayed so much patience and understanding of the demands of graduate school and have always been right there to offer support, encouragement, and many invitations to enjoy time with our family. In addition, my sister, Alison, my brother, Ryan, and my brother-in-law, Jared, have also been incredibly patient and supportive, providing lots of laughs and fun times. Finally, I am grateful for my parents-in-law, Dave and Teddi Nelson, and my brother-in-law, James, who have encouraged me from a distance. Time spent together with them as a family in Virginia has provided important times of restoration and laughter throughout my graduate career.

ACKNOWLEDGEMENTS

Data used for this dissertation were collected as part of a larger research project, the Teen Experiences Study. The project would not have been possible without the cooperation of the participating school district, principal, teachers, staff, students, and parents. Their assistance and time is greatly appreciated. Special thanks go to Dr. Bridget Biggs for her support and time in collaborating on this project with Dr. Vernberg and the author of this dissertation. In addition, the diligence, conscientiousness, and time of the research assistants who worked on this project made it more enjoyable and manageable.

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ADOLESCENT PEER-RELATED SOCIAL STRESS AND VULNERABILITIES FOR UNDERAGE DRINKING

Underage drinking is regarded as a common adolescent behavior yet considered a widespread public health problem in the United States that can compromise healthy adolescent development in contributing to a range of physical health, psychological, and academic difficulties. Despite a recent and promising downward trend in the percentages of adolescents who drink and drink heavily, current national epidemiological data suggest that three out of every four high school seniors (75-80%) have consumed alcohol before the completion of high school (with 63-75% of 10th graders having consumed alcohol; Eaton, Kann, Kinchen, Ross, Hawkins et al., 2006; Johnston, O'Malley, Bachman, & Schulenberg, 2006). Of more concern, over half of high school seniors (57%) and over two-fifths of 10th graders (42%) report having been drunk at least once (Johnston et al., 2006).

Adolescents who become intoxicated are at risk for a range of short- and long-term negative consequences, some of which only require one drinking incident to take effect (e.g., motor vehicle accidents). According to the Centers for Disease Control and Prevention (CDC), alcohol frequently contributes to the leading causes of death among adolescents (i.e., motor vehicle accidents, unintentional injuries, homicides, and suicides; Eaton et al., 2006). Recent neurocognitive research has cited the negative effects of more chronic heavy drinking on adolescent brain development (i.e., compromised memory and attention processes, disruption of myelination, less efficient synaptic pruning, decreased hippocampal size; Brown & Tapert, 2004).

Furthermore, alcohol use has been found to contribute to poor academic performance (Ellickson, Tucker, & Klein, 2003), delinquent behavior (Ellickson et al., 2003), smoking and illegal drug use (Ellickson et al., 2003), poor coping with psychological difficulties, and risky sexual behavior.

Although much research has investigated factors that make adolescents prone to drinking and its negative effects, the wealth of previous work has tended to focus on risk factors for alcohol use in the context of serious delinquency or antisocial behavior (particularly among boys; see Wills & Dishion, 2004). This subpopulation of adolescents is more likely to display extreme and obvious indicators of maladjustment that highlight their alcohol use and abuse (e.g., school drop-out, criminal violence, life threatening risk-taking). They also likely share characteristics with those of the adolescent-limited or life-course persistent typologies of adolescents displaying conduct problems (Moffit, 1993), including some combination of aggressive and oppositional temperament, poor parental management practices, rejection from mainstream peers, and subsequent affiliation with a deviant peer group that encourages further problem behavior. Aside from the important and informative focus on serious substance use in the context of delinquency, conceptual models and empirical research aimed at explaining alcohol use in the general adolescent population have been lacking or oversimplified in their accounts of developmental and other contributors to use (Psychosocial Processes, 2004/2005). Adolescents who do not engage in high levels of deviant behaviors may nonetheless have significant alcohol use that can put them at risk for immediate consequences of intoxication (e.g.,

injury-related mortality, unplanned or risky sexual behavior) or set the stage for the development of more serious problems with alcohol or other substance abuse.

In 2003, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) of the National Institutes of Health (NIH) issued an Initiative on Underage Drinking to address the increasing societal concerns about this longstanding problem. *Alcohol Research and Health*, the peer-review journal of the NIAAA, published a special issue to address this initiative in 2004/2005. Among many other directions for future research, the portion of the issue pertaining to "Psychosocial Processes and Mechanisms of Risk and Protection" outlined five of the most influential theories previously devised to explain adolescent substance use. Notably, the authors pointed out that the majority of these theories have been "directed toward antisocial and deviant involvement with alcohol and other drugs," failing to "address the underage drinking behavior of youth thought to be successful and mainstream" (Psychosocial Processes, 2004/2005, p. 149). The multidimensional model of adolescent alcohol use tested in the current study was proposed in response to this call for the "synthesis and testing of new and comprehensive models that reflect the complex multicausality of all underage drinking behavior within a developmental framework" (Psychosocial Processes, 2004/2005, p. 149).

The present study aimed to examine a comprehensive model of risk factors for adolescent alcohol use drawn from several influences highlighted by the NIAAA Initiative on Underage Drinking as of potential importance for better understanding alcohol use among mainstream adolescents (i.e., peer influence, self-esteem, coping

style, and alcohol expectancies; Psychosocial Processes, 2004/2005). Additionally, this model was tested during the semester following 10th grade adolescents' transition to the high school building in the participating school district, representing a developmental period common to adolescence during which related social stressors can be compounded and likely to make adolescents more susceptible to drinking behavior (Graber & Brooks-Gunn, 1996).

Given that adolescent school transitions involve new and changing peer relationships during a time when social acceptance and support are highly valued (Aikins, Bierman, & Parker, 2005; O'Brien & Bierman, 1988), the construct of peer-related social stress was central to the model examined in this study. Peer-related social stress was conceptualized differently than other aspects of peer influence previously examined in relation to alcohol use among adolescents; the degree to which adolescents desired increased belonging within valued peer crowds was assessed as an indicator of adolescents' social stress expected to relate to alcohol use among some adolescents in the context of ever-changing peer relationships. Furthermore, in keeping with the broad goal of developing a more comprehensive model of adolescent alcohol use, the present study assessed peer-related social stress in combination with three emotional and cognitive constructs (i.e., self-esteem, coping style, and alcohol expectancies) also expected to relate to alcohol use. These influences on adolescent alcohol use have not been previously examined in combination prior to this study. The overarching purpose of attempting to understand how the combination of the risk factors examined related to adolescent alcohol use

was to inform more directed prevention and intervention efforts that more appropriately address the social, emotional, and cognitive factors that make typically developing adolescents in school-based community samples more prone to engaging in risk behaviors.

Peer-Related Social Stress as a Contributor to Alcohol Use

Previous work on adolescent health risk behavior has pointed to peer influence as a strong predictor of the likelihood that adolescents engage in risk behaviors (Urberg, Degirmencioglu, & Pilgrim, 1997). Children and adolescents rejected by mainstream peers have been found to subsequently gravitate toward deviant peer groups that introduce and support the use of alcohol and other substances (Moffit, 1993; Parker & Asher, 1987; Prinstein & La Greca, 2004). Less specific to rejected and deviant adolescents, the degree to which adolescents in general have best friends who use alcohol has been found to be a consistent predictor of initial alcohol use and change in alcohol use over time (Hawkins, Catalano, & Miller, 1992; Wills & Cleary, 1999). In addition to the influence of close friends, adolescents' membership in social crowds in which drinking is a prevalent behavior has also been predictive of adolescents' own levels of drinking behavior (La Greca, Prinstein, & Fetter, 2001; Sussman, Dent, & McCullar, 2000).

Beyond explicit affiliation with close friends and peer crowds who engage in similar levels of health risk behavior, the role of adolescents' *perceptions* of risk behavior among their peers as contrasted with the *actual* behaviors of those peers has been examined in predicting adolescents' own risk behaviors (Iannotti & Bush,

1992). Recent studies have begun to demonstrate that adolescents tend to perceive that peers with higher reputation-based popularity and membership in higher status peer crowds engage in higher levels of externalizing behavior, including aggression, substance use, and sexual risk behavior (Prinstein & Cillessen, 2003; Prinstein & Cohen, 2006; Prinstein, Meade, & Cohen, 2003). These beliefs, in turn, can be expected to lead to increases in an adolescent's own levels of risk behavior if he or she desires to increase his or her popularity and social status.

Particularly during the period of friendship instability that often accompanies adolescent school transitions, adolescents may be more sensitive to experiencing stress and anxiety related to feelings that their levels of social status and peer crowd belonging are less than desired. In the present study, such feelings were conceptualized as peer-related social stress, a construct that was operationalized as the desire to increase belonging in school social crowds. The goal of assessing this construct was to tap adolescents' internal sense of concern about maintaining the level of social status and belonging that they desire. Although this construct is thought to be different from pure measures of peer pressure (e.g., overt coercion and threats of rejection), the more overt experiences of peer victimization and peer pressure may contribute to this internal sense of social stress for some adolescents.

Studies of related constructs in childhood, such as peer rejection and low peer acceptance, support the notion that less than desired popularity and social status can be a stressful experience. The past several decades have brought forth increased understanding of the social processes of peer acceptance and rejection among

children and documented causes for and consequences of lacking acceptance and rejection (Newcomb, Bukowski, & Patee, 1993). Specifically, rejected and victimized children and adolescents have been found to experience low self-esteem, depressive symptoms, anxiety, and loneliness (Hawker & Boulton, 2000; Panak & Garber, 1992), as well as report physiological symptoms of stress and anxiety (Nishina, Juvonen, & Witkow, 2005). While not all adolescents who are concerned about achieving higher social status and popularity experience internalizing difficulties, it does seem likely that some adolescents find the experience stressful and call upon coping strategies that may motivate them to behave in ways that will improve social standing and subsequently reduce related social stress (e.g., by drinking).

Little research to date has considered the role that social cognitive perceptions and concerns about social status and belonging may play in leading adolescents to engage in alcohol use. The social developmental literature has only recently begun to carefully examine adolescents' cognitive perceptions of their peers' health risk behaviors (Prinstein & Cohen, 2006; Prinstein & Wang, 2005). Additionally, the clinically-relevant literature that has attempted to examine more comprehensive models of alcohol use and abuse has tended to assess drinking as a response to more global measures of negative life events, rather than focusing on the particular vulnerabilities related to stress in the adolescent peer group (Laurent, Catanzaro, & Callan, 1997). Therefore, examining the relationship between peer-related social stress and alcohol use seems an important new direction for improving understanding of adolescent alcohol use.

Beyond the specific hypotheses pertaining to peer-related social stress, the broader aim of the proposed study involved examining peer-related social stress as one potential risk factor for alcohol use among other risk factors expected to combine to represent a more comprehensive model of risk factors related to mainstream adolescent alcohol use. Adolescent self-esteem, coping style in response to social stress, and alcohol expectancies were additionally expected to contribute to the comprehensive model, allowing for more specific characterization of adolescents with varying degrees of risk for involvement in alcohol use and abuse.

Low Self-Esteem as a Social Risk Factor

Self-esteem is thought to be particularly important to examine during the first years of high school, given the typical threats to various aspects of self-esteem during this time period (Aikins et al., 2005; Graber & Brooks-Gunn, 1996). Especially relevant to this project, adolescents who follow trajectories of increasing difficulties with low self-esteem from 6^{th} to 10^{th} grade have been found to be more susceptible to peer pressures and engage in higher levels of alcohol use by the time they reach 10^{th} grade (Zimmerman, Copeland, Shope, & Dielman, 1997). In the present study, lower self-esteem was anticipated to predispose adolescents to increased social stress related to dissatisfaction with their place in the ever-changing peer group. In turn, adolescents who reported lower levels of self-esteem *and* experienced higher levels of peer-related social stress were expected to be at increased risk for engaging in underage drinking. Additionally, the moderating role of self-esteem in the peer-related social stress and alcohol use relationship was considered.

Emotional and Cognitive Mechanisms in Responding to Social Stress

In addition to self-esteem and social influences (e.g., peers), coping style (Bonin, McCreary, & Sadava, 2000) and alcohol expectancies (Earlywine, 1994; Goldman, Del Boca, & Darkes, 1999) have been found to contribute to alcohol use. In their review of the literature pertaining to alcohol as a mechanism for tension reduction, Greeley and Oei (1999) pointed to the stress-vulnerability model as gaining favor for conceptualizing moderators of the relationship between stress and alcohol use. Greeley and Oei (1999) suggested the importance of incorporating two such moderators, coping and alcohol expectancies, into the same model to examine how they may interact in the mutual prediction of alcohol use. The development of a conceptual model for adolescent alcohol use that includes these constructs requires the melding of several different literatures. This section briefly reviews each literature as it relates to peer-related social stress and alcohol use.

Coping style. Coping has been most generally defined as how people respond to life stressors of various magnitudes and durations. Partially in response to the broad range of stressors experienced, the history of measurement in the coping literature has been somewhat disjointed and has lacked focus on assessing coping with specific stressors. For the purposes of the present study, coping was considered much more specifically in the context of social stresses, particularly adolescents' feelings of stress in adjusting to and attempting to fit into their school social network. Therefore, the measurement scheme put forth by Connor-Smith and colleagues was selected for use in this study (Connor-Smith, Compas, Wadsworth, Thomsen, &

Saltzman, 2000). This approach to the assessment of coping style was designed for use with adolescents (rather than downwardly extended from an adult measure) and assesses both voluntary coping strategies and involuntary stress responses in the specific context of social stress (see Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001).

Previous literature has made numerous attempts to relate coping style to alcohol use in a social context. Maladaptive coping theory has suggested that engaging in risk behavior, such as underage drinking, may serve the purpose of coping with a desire to improve social status (Spear, 2000). Alternatively, other adolescents seeking to manage the negative emotions and physiological effects of stress related to social standing may elect to use alcohol more for the relief of these symptoms (e.g., Cooper, 1994; Laurent et al., 1997). Socially withdrawn adolescents, for example, have been found to engage in more emotion-focused and less engaged coping styles when faced with peer hassles (Bowker, Bukowski, Hymel, & Sippola, 2000), which may likely make such adolescents more susceptible to drinking alcohol as a strategy for coping with their heightened emotions. Evident in each of these examples of the role alcohol plays in coping with social stress is the need to also assess adolescents' beliefs about the expected effects of alcohol use (e.g., to increase social standing or to reduce negative emotions), which highlights the benefits of examining adolescents' alcohol expectancies in tandem with their coping tendencies.

Alcohol expectancies. Adolescents' thoughts about the effect of alcohol on their emotions and functioning have been found to play an important role in

predicting the use of alcohol (Goldberg, Halpern-Felsher, & Millstein, 2002; Goldman et al., 1999). This idea has most often been captured with the construct of alcohol expectancies, which can be thought of as representing a working model of how alcohol will affect a person (e.g., tension-reduction, changes in social behavior, increased arousal; Goldman et al., 1999). Although the development of these expectancies has been thought to take form as early as childhood (Dunn & Goldman, 1996), adolescence seems to be a developmental period during which beliefs about the effect of alcohol plays a crucial role in whether adolescents decide to drink. Fromme and D'Amico (2000) validated their Comprehensive Effects of Alcohol (CEOA) measure of alcohol expectancies among adolescents and found that negative expectancies of cognitive and behavioral impairment and positive expectancies of improved social behavior were related to alcohol use.

Greeley and Oei (1999) argued for the importance of considering the interrelations among alcohol expectancies, coping, and gender when assessing whether alcohol use occurs as a response to stress. These factors have together been found to relate to vulnerability to stress among adults (e.g., avoidant and emotion-focused coping combined with positive alcohol expectancies in men; Cooper, Russell, Skinner, Frone, & Mudar, 1992), and Greeley and Oei (1999) have called for additional studies that consider the joint effects of these factors. Additionally, little research has considered these factors among adolescents and in response to the specific stress of adolescent peer relationships in transition. For example, it may be that adolescents who perceive high levels of peer-related social stress are more likely

to drink if they (a) engage in primary control engagement coping (e.g., problem solving) and expect that alcohol will increase their sociability, or (b) experience high levels of disengagement coping and involuntary engagement stress responses (e.g., emotional arousal and rumination) and expect that alcohol will reduce such tension. The latter interaction between tension reduction positive alcohol expectancies and avoidant coping has been supported in predicting adolescent alcohol use in the context of more generalized negative life events (see Laurent et al., 1997). In the present study, both proposed moderated relations were expected to be supported as additional risk factors for adolescent alcohol use when assessed simultaneously with peer-related social stress and self-esteem.

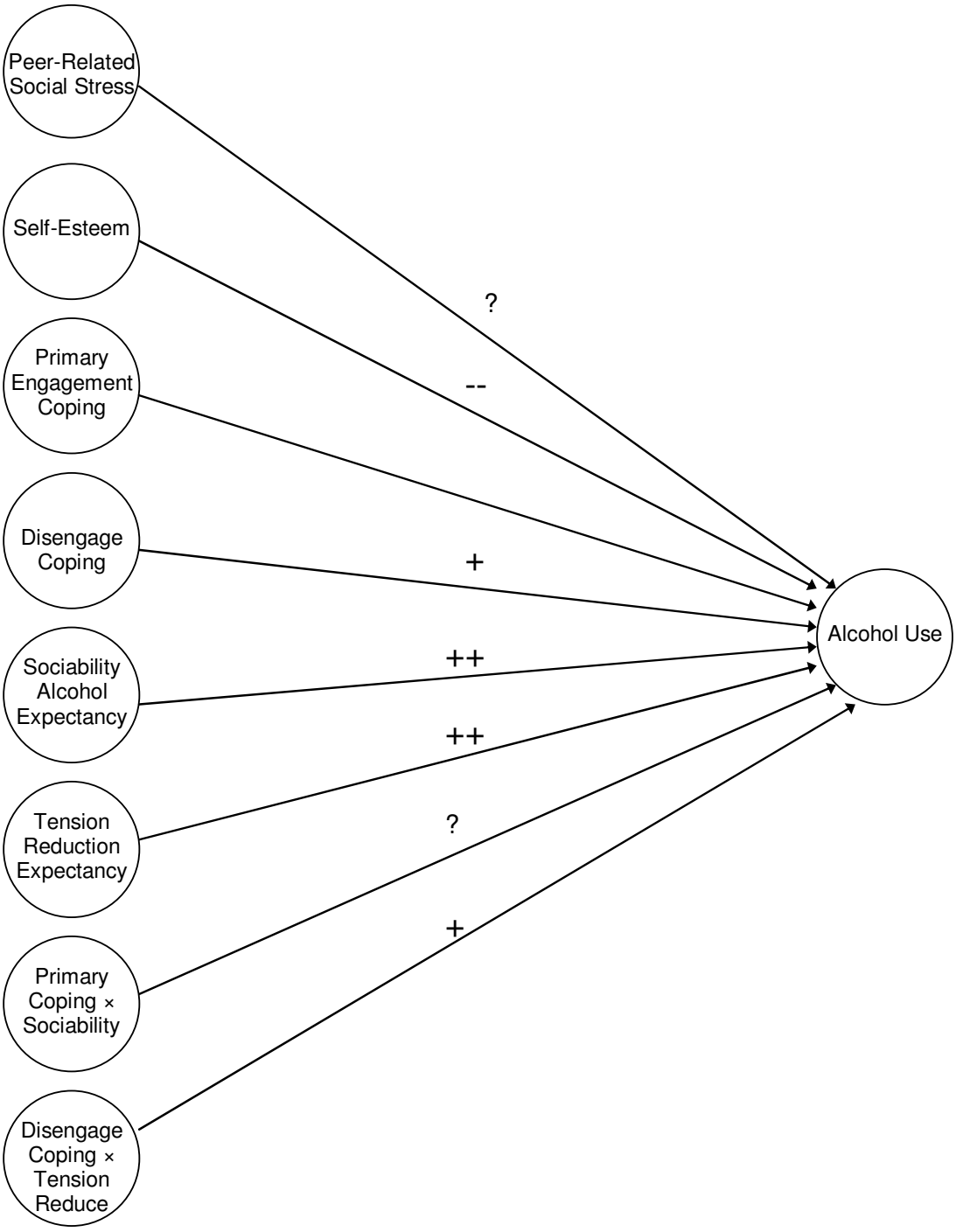
Summary of Study Aims

The present study builds on the existing literature by integrating a series of constructs (i.e., peer-related social stress, self-esteem, coping style, and alcohol expectancies) previously found to be independently related to alcohol use into a more comprehensive model in an attempt to account for the complex and dynamic nature of mainstream adolescent alcohol use. This study aim is consistent with the NIAAA Initiative on Underage Drinking call for more comprehensive models that can explain profiles of risk factors for underage drinking among mainstream, community samples of adolescents (Psychosocial Processes, 2004/2005).

The following is a summary of the specific study hypotheses involving the constructs comprising the hypothesized comprehensive model. Peer-related social stress and lower self-esteem were each expected to be related to higher levels of

adolescent alcohol use. Additionally, disengagement coping and sociability and tension reduction positive alcohol expectancies were expected to be related to alcohol use; however, these relations were expected to be better explained with significant moderated relationships between primary control engagement coping and sociability positive alcohol expectancies, and between disengagement coping and tension reduction positive alcohol expectancies. Notably, each of these effects was expected in the presence of the other effects, thus supporting a comprehensive model highlighting multiple independent yet simultaneous risk factors for adolescent alcohol use (see Figure 1). In addition to these specific study hypotheses, preliminary analyses were used to assess whether any additional moderated relations among the constructs of interest were warranted for inclusion in the comprehensive model (e.g., moderated relations between peer stress and self-esteem and between involuntary stress responses and the other constructs). These additional mechanisms were examined due to their plausible conceptual relation to alcohol use and their lack of substantive support in prior research. Finally, gender differences in the final comprehensive model were considered. Mixed evidence of gender differences in previous comprehensive models of alcohol use similar to that examined in the proposed study made it difficult to make specific a priori hypotheses with regard to gender (see Laurent et al., 1997).

Figure 1
Hypothesized Comprehensive Model of Adolescent Alcohol Use



Note. Symbols above each path represent the direction and strength of each relation based on prior research. + = positive association, ++ = strong positive association, -- = negative association, *?* = relation not previously tested.

Method

Sample and Procedures

Participants were 160 tenth grade students (88 boys and 72 girls, *M* age = 15.8 years) in their first semester of attendance at one high school in a medium-sized Midwestern city. According to their self-reported ethnicity, the sample of adolescents was 75.0% European American, 7.5% African American, 3.8% Hispanic, 2.5% Native American, 1.9% Asian or Asian American, and 9.3% multiracial or other ethnicity. The gender and ethnic diversity of the sample was compared to the larger school-level demographics using a web-based chi-square calculator (Preacher, 2001). The gender and ethnic breakdowns of the sample were not significantly different from the breakdown of each demographic in the larger school population (49.9% girls, χ^2 (1) = 1.54, p = .22; 73.8% European American, 9.4% African American, 4.5% Hispanic, and 12.3% Other, χ^2 (3) = 1.12, p = .77).

It was more difficult to assess the economic diversity of the sample, given the limitations of gathering this information via adolescents' self-reports of their parents' levels of education (i.e., 18.7% of adolescents indicated that they did not know their father's level of education and 17.5% of adolescents did not know their mother's level of education). Among those fathers for whom adolescents reported their education levels, 6.2% did not complete high school, 27.6% completed high school, some college, or job training, 25.6% completed college, and 21.9% obtained master's or doctoral degrees. Among those mothers for whom adolescents reported their education levels, 3.7% did not complete high school, 31.9% completed high school,

some college, or job training, 29.4% completed college, and 17.5% obtained master's or doctoral degrees.

Recruitment strategies to gain parent consent for adolescent participation included: (a) visiting adolescents' seminar classes at school to introduce the project and distribute parent consent paperwork, (b) mailing parent consent paperwork to all parents or guardians of 10th grade students enrolled at the time recruitment began, (c) following up mailings at least one week later with a phone call to parents to make sure they received the mailing, offer to answer questions about the project, and make parents aware of the deadline for returned consent forms, (d) sending follow-up mailings at parents' requests if they showed interest in participating and did not receive or misplaced the initial mailing, and (e) returning to students' seminar classes to remind students of the upcoming deadline for returned parent consent forms. Only students who had signed parent consent forms (60% of parents contacted) and provided student assent (76% of students with parent consent, 45% of parents contacted) participated.

Participating adolescents completed measures as part of a paper-and-pencil questionnaire during one 45-minute in-school testing session during the Fall of their 10th grade year. Trained research staff (i.e., graduate and undergraduate research assistants and faculty members involved with the project) administered in-school questionnaires and were available to answer questions during these 45-minute sessions. Participating adolescents were then asked to complete a second 20-minute online questionnaire supplemental to the present investigation during the two weeks

following the in-school data collection session. Adolescents who completed both phases of data collection received a $10 gift certificate to a local department store. All procedures described above were approved by the University of Kansas Human Subjects Committee, and a Department of Health and Human Services (DHHS) Certificate of Confidentiality was obtained from the National Institute on Alcohol Abuse and Alcoholism (NIAAA). The certificate provides special protection against the release of identifiable data pertaining specifically to adolescents' reports of illegal behavior, in this case underage alcohol use.

Measures

Demographic characteristics. Participating adolescents provided self-reports of the following demographic information: birth date, gender, ethnicity, and socioeconomic status (i.e., parents' levels of education).

Peer-related social stress. The discrepancy between adolescents' ratings of their perceived current and desired levels of social belonging was used to operationalize the construct of peer-related social stress. Adolescents rated their current and desired levels of belonging on scales of 0-100 for each of six social reference points, including popularity, belonging within several general social crowds (jocks, burnouts, and brains or nerds), belonging within an additional social crowd of salience to each individual adolescent, and general belonging at school. Higher numbers on the scales represented higher levels of belonging compared to other same-aged peers (e.g., "How popular are you right now and would you like to be compared to other kids in your grade?).

The social reference points were expanded in the present study beyond the single reference point of popularity that was used in the original version of this measure (see Prinstein & Aikins, 2004) to allow for measurement of adolescents' current and desired belonging among other peer crowds and sense of belonging at school in general. It was hypothesized that some adolescents may be more concerned about their social standing in peer crowds aside from the popular crowd. Additionally, it was suspected that some adolescents may not feel particularly drawn to any of the peer crowds but may be able to report on their general sense of belonging at school. The crowd names utilized in the rating scales were drawn from adolescent social crowds identified by Brown (1989) and have more recently been utilized in assessing adolescents' perceptions of the level of health risk behavior among various crowds at school (e.g., Prinstein & Cohen, 2006). Informal consultation with staff at the targeted high school expected to have some insight to students' social adjustment (e.g., school counselors, teachers who were parents of students in the school) yielded a list of school crowd names thought to be meaningful to current students. This list was used to verify that the crowd names utilized in the measurement of actual-desired peer group belonging would be meaningful to participating students.

Adolescents' *perceived current* level of belonging was subtracted from their *desired* level of belonging for each of the six scales to yield six discrepancy scores, where positive scores suggested an implied desire to increase belonging and negative scores or scores of 0 indicated a general level of satisfaction with the current level of social belonging (Prinstein & Aikins, 2004). Adolescents' ratings of their *desired*

status for each of the six scales were then used to rank-order their six discrepancy scores from the score for the *most* desired social crowd to the score for the *least* desired social crowd. For example, a discrepancy score for a crowd within which a given adolescent desired to belong more than 90% of his or her peers was ranked higher than a discrepancy score for a crowd within which a given adolescent desired to belong more than 75% of his or her peers. Such rank-ordering was based on the premise that the peer crowds within which an adolescent most desired to belong were the most salient in determining potential peer-related social stress for that adolescent. Furthermore, given that a rating of 50 on the 0-100 scales indicated a desire to belong more within a respective crowd than half of the other students in an adolescent's grade, this threshold of 50% was used as a cut-off for defining desire for belonging (i.e., adolescents desired to be part of crowds for which they rated their desire as 50 or higher on the 0-100 scales).

After the six actual-desired peer group belonging discrepancy scores were rank-ordered based on ratings for desire, the number of peer crowds within which each adolescent desired to belong was calculated to determine how many different crowds from among the six were considered important for each adolescent. Of the 160 adolescents, 157 adolescents rated at least one peer crowd as important, and 154 adolescents rated at least two peer crowds as important. Because the number dropped to 141 adolescents who rated at least three peer crowds as important, the discrepancy scores for the top two most desired peer crowds were averaged to represent each adolescent's peer-related social stress, or desire for increased belonging in crowds

within which the adolescents most desired to be accepted. As expected, there was variability in what two specific peer crowds were considered most important across the sample of adolescents (see Table 1).

Given the nuance and exploratory nature of refining the measurement of peer-related social stress in the present investigation, supplemental analyses were conducted to assess the validity of the measurement approach explained above. Specifically, correlations between peer-related social stress (i.e., the average of the actual-desired social belonging discrepancy scores for the top two most desired peer crowds) and several constructs expected to relate to peer social stress were considered. Peer-related social stress was positively correlated with a measure of adolescents' desire to increase or maintain their popularity ($r = .21$, $p < .01$; adapted from Prinstein & Aikins, 2004) and was negatively correlated with adolescents' self-reports of popularity ($r = -.33$, $p < .01$; adapted from Prinstein & Aikins, 2004) and social acceptance ($r = -.18$, $p < .10$; Harter, 1988). Additionally, the actual-desired social belonging discrepancy scores for the most desired and second most desired peer crowds were sufficiently correlated ($r = .42$, $p < .001$) to warrant averaging them into an aggregate construct for regression analyses and combining them into a latent construct for SEM analyses.

Self-esteem. The 5-item global self-worth subscale of the Self-Perception Profile for Adolescents (SPPA; Harter, 1988) was used to assess adolescents' self-esteem. Of note, the construct of 'self-esteem' has been used interchangeably with 'self-worth' as measured by the SPPA (Harter, 1988). 'Self-worth' will be used only

Table 1

Frequency of Adolescents Rating Each Social Reference Group Among Their Top Two Most Desired for Belonging

Social Reference Groups	Number of Adolescents
Populars	70
Jocks	34
Burnouts (for example, drunk or pothead)	4
Brains or Nerds	53
Other crowd	50
100% OG	1
Alternative	1
Anime fan/nerds	2
Artsie-fartsie	1
Athletes	3
Average/Everybody/Normal	5
Band Geeks	9
Christian	1
Drama/Drama Geeks Theater Geeks/Kids/Thespians	6
Gangsters	4
Goody goodies	1
Independent – No Such Thing	1
Music lovers and vegetarians	1
Musical crowd	1
NWA	3
Poputer	1
Preps	1
Skater	1

Slaker	1
Spanish	1
Unidentified other crowd	5
Fitting in at school	109

Note. Frequencies listed represent the numbers of adolescents who rated each social reference group within their top two most desired groups among the six groups rated. 'Other crowd' names are listed verbatim from participant responses. Of the 160 participants, 32 adolescents (20%) rated *more* than two groups as *equally* most desired. In 25 of these 32 cases, actual-desired belonging discrepancy scores for the two groups with the *most* positive discrepancy scores were included in analyses. Choosing the most positive scores when more than two groups were equally most desired meant that scores were analyzed for those groups within which adolescents most desired increased belonging. In the remaining 7 of these 32 cases, the choice about which two groups to include was arbitrary because the discrepancy scores were the same for all highly desired groups. When choices had to be made in the process of selecting scores for only two desired groups to include in analyses for each adolescent, scores for the following equally desired groups were eliminated for each respective frequency of adolescents: Populars = 7; Jocks = 9; Burnouts = 1; Brains or Nerds = 6; Other crowds = 8 (ABC Crew = 1, Cleptic = 1, NWA = 1, Video Gamer = 1, unidentified other crowds = 4); and Fitting in at school = 11. Furthermore, for the 3 adolescents who did not identify any groups within which they desired to belong at the 50% threshold, their actual-desired discrepancy scores were included for the top two groups they desired, even though they rated their desire for these groups below the 50% threshold. Similarly, for the additional 3 adolescents who identified only one, but not two, desired groups at the 50% threshold, their actual-desired discrepancy score for the second most desired group was included, again even though their rating of desire for belonging in this second group was below 50%.

in discussion of measurement, but for ease of communication, 'self-esteem' will be used to refer to the construct throughout. The global self-worth subscale was selected for use in the proposed study rather than the domain-specific subscales developed by Harter (1988) for several reasons. Global self-esteem is thought to relate more strongly to overall psychological well-being, while specific self-esteem has been found to be a stronger predictor of behaviors within a relevant domain (e.g., academic self-esteem and academic functioning; Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995). When adolescents are faced with decisions about using alcohol in the context of peer-related social stress, their vulnerability is likely drawn in part from the balance of many facets of their self-esteem (e.g., physical appearance, athletic competence, romantic appeal, close friendship) that may either be protective or generate feelings of other deficits in addition to concerns about social status. Therefore, no specific domain seemed likely to generalize as most important across all adolescents, and adolescents' global self-esteem was determined to be a more parsimonious measure for use in beginning to assess how adolescent self-esteem may contribute to drinking in the context of peer stress.

For each item on the SPPA global self-worth subscale, adolescents were presented with two sentences separated by the word "But," with each statement reflecting either high or low self-esteem. The following is a sample item: "Some teenagers are very happy being the way they are BUT other teenagers wish they were different." Adolescents chose one of the two alternatives and then indicated whether the selected alternative was *really true for me* or *sort of true for me*. This response set

created a 4-point scale for the items that were summed and averaged across items, with lower scores representing lower self-worth. The global self-worth subscale of the SPPA demonstrated good internal consistency reliability across all four original validation samples of adolescents (α = .80 to .89; Harter, 1988), as well as within the present sample (α = .84).

Coping style. The 57-item Responses to Stress Questionnaire (RSQ), Social Stress Version (Connor-Smith et al., 2000) was used to assess adolescents' voluntary coping and involuntary stress responses in the specific context of social stress. On the first portion of the RSQ, adolescents chose from among a list of socially stressful events they may have experienced recently (e.g., "Not having as many friends as you want") and rated the extent to which those events caused them distress. Then adolescents were asked to rate a series of items on a 4-point scale (*1* = "not at all" and *4* = "a lot") designed to tap the degree to which they utilized three broad dimensions of voluntary coping with the social stressors they endorsed in the first portion of the measure. The 9-item Primary Control Engagement Coping factor tapped problem solving, emotional expression, and emotional regulation (e.g., "I try to think of different ways to change the problem or fix the situation."). The 12-item Secondary Control Engagement Coping factor assessed cognitive restructuring, positive thinking, acceptance, and distraction (e.g., "I tell myself that things could be worse."). The 9-item Disengagement Coping factor measured denial, avoidance, and wishful thinking (e.g., "When I'm around other people I act like the problems never happened"). Additional items measured two dimensions of participants' involuntary

response to social stress: the 15-item Involuntary Engagement factor (tapping rumination, intrusive thoughts, emotional arousal, physiologic arousal, and impulsive action; e.g., "When problems with other kids come up, I can't stop thinking about how I am feeling."); and the 12-item Involuntary Disengagement factor (assessing cognitive interference, involuntary avoidance, inaction, and emotional numbing; e.g., "When problems with other kids happen I don't feel anything at all, it's like I have no feelings.").

Initial research has found Primary and Secondary Control Engagement Coping to be related to lower levels of externalizing and internalizing problems, and Disengagement Coping and Involuntary Engagement and Disengagement responses to be related to more behavioral and emotional difficulties (Connor-Smith et al., 2000). Given the preliminary nature of findings that suggest the RSQ yields interpretable clusters of coping styles from among its various factors (Reinhard, Wolff, & Wadsworth, 2006), each of the factors were used in isolation as continuous variables in the present investigation to determine the degree to which high or low levels of each type of coping or stress response related to alcohol expectancies and other constructs in the proposed model. Each of the isolated factors on the RSQ has been found to be valid and reliable among several different samples of adolescents (see Connor-Smith et al., 2000). Additionally, each of the five factors demonstrated adequate internal consistency reliability in the present sample ($\alpha = .79$ for Primary Control Engagement Coping; $\alpha = .77$ for Second Control Engagement Coping; $\alpha = .68$ for Disengagement Coping; $\alpha = .91$ for Involuntary Engagement; and $\alpha = .83$ for

Involuntary Disengagement).

Alcohol expectancies. Adolescents' alcohol expectancies were assessed using the 8-item Sociability Positive Alcohol Expectancies factor and the 3-item Tension Reduction Positive Alcohol Expectancies factor from the 38-item Expected Effects portion of the Comprehensive Effects of Alcohol (CEOA) questionnaire (Fromme, Stroot, & Kaplan, 1993). Participants rated each item on a 4-point scale (*1* = "disagree" to *4* = "agree") in terms of the degree to which they felt that a given effect of alcohol was expected for them. The Sociability factor tapped the degree to which adolescents expected they would become more socially comfortable and outgoing when under the influence of alcohol (e.g., "It would be easier to talk to people."). The Tension Reduction factor assessed the degree to which adolescents expected they would become more relaxed when drinking (e.g., "I would feel calm."). The CEOA in general has been found to demonstrate good internal validity (α = .84 for the Sociability factor and α = .73 for the Tension Reduction factor) and temporal stability in adolescent samples (test-retest reliability across 3 months between .41 and .61; Fromme & D'Amico, 2000), as well as construct and criterion validity in a young adult sample (Fromme et al., 1993). Both the Sociability and Tension Reduction factors demonstrated good internal consistency reliability in the present sample (α = .88 and α = .75, respectively).

Alcohol use. A series of 6 items assessing recent, lifetime, and heavy drinking was used to measure alcohol use (J. W. Graham, personal communication, April 2006; Prinstein & Cohen, 2006; Taylor, Graham, Cumsille, & Hansen, 2000). Three

items tapped *recent alcohol use*: (a) "During the past 30 days, how many times did you have at least 1 alcoholic drink?" with response options from *0 times* [1] to *20 or more times* [5]; (b) "How many alcoholic drinks have you had in the past month?" with response options from *none* [1] to *more than 50 drinks* [9]; and (c) "How many days in the past month have you had alcohol to drink?" with response options from *none* [1] to *15 to 30 days* [6]. *Lifetime alcohol use* was assessed with the following single item: "How many alcoholic drinks have you had in your whole life?" with response options from *none, I have never had even one sip of alcohol* [1] to *more than 50 drinks* [9]. *Recent binge drinking* was measured with the following single-item: "During the past 30 days, how often did you have 5 or more alcoholic drinks on a single occasion (within a few hours)?" with response options from *0 times* [1] to *10 or more times* [5]. *Lifetime drunkenness* was tapped with the following single item: "How many times have you ever been drunk?" with response options from *never* [1] to *more than 20 times* [6]. For the purposes of creating a single alcohol use variable for preliminary regression analyses, the six items were standardized and averaged to create a single composite score (Taylor et al., 2000). For the purposes of SEM, the six alcohol use items were parceled (see below) and combined into a multi-faceted latent construct of alcohol use. The alcohol use composite score demonstrated good internal consistency reliability in the present sample ($\alpha = .94$).

Treatment of Missing Data

There was a small amount of missing item-level data within the data set. Among the measures utilized in the present investigation, 1.0% of the item-level data

were missing. Because of the potential for biased parameter estimates when not all available data are included in analyses, the EM imputation algorithm was employed using SAS PROC MI to impute the missing data points (Graham, Cumsille, & Elek-Fisk, 2003). All of the data gathered across all items of all measures during the in-school data collection were utilized in the PROC MI procedure, meaning that the missing data were estimated from the full item pool from the larger database. Using all available data in imputation procedures generates more accurate estimated data and an imputed data set that best reflects the characteristics of the original data set, optimizing the likelihood of producing unbiased and accurate parameter estimates (Graham et al., 2003).

Data Analysis Plan

Data analyses were conducted in three stages to examine the proposed comprehensive model of additive risk factors for adolescent alcohol use. First, preliminary regression analyses were conducted to identify those main effect and interaction terms, from among the constructs and moderated relations of interest, which were significantly related to alcohol use and therefore warranted for inclusion in the final multivariate SEM models. Given that there were a number of other conceivable moderated relations among the constructs of interest that had not yet been supported by prior research, the preliminary regression analyses were also used to assess these more exploratory relations to guide the inclusion of all relevant constructs and moderated relations in the final models.

Second, the latent structural relations between those terms identified in the preliminary regressions and alcohol use were examined across the entire sample using SEM, to assess how the identified risk factors operated in combination to predict alcohol use. All SEM models were run using the effects-coding method of identification (Little, Slegers, & Card, 2006) in LISREL 8.80. There are several benefits of utilizing SEM, particularly with respect to the analysis of interaction terms utilized to capture moderation. Traditional data analytic techniques such as multiple regression yield parameter estimates that assume variables are measured reliably and without measurement error; however, the inevitable presence of measurement error negates this assumption, subsequently leading to biased results. The use of latent variables in SEM removes measurement error from each construct, leaving only reliable information to be utilized in assessing the relationships among the constructs of interest. This benefit of SEM is further compounded when interaction terms are evaluated. In traditional data analytic techniques, the measurement error associated with main effect terms is compounded in interaction terms, making such interaction terms even more unreliable (Holmbeck, 1997). In SEM, interaction terms are modeled as separate latent constructs from their associated main effects, with these latent constructs also benefiting from the removal of measurement error (Little, Bovaird, & Widaman, 2006). Because of the removal of this unreliability, SEM allows for more available statistical power for detecting interactions.

Third, a two-group SEM model was run to determine whether there were gender differences in the pattern of latent variables found to relate to alcohol use in

the overall sample. An additional benefit of SEM involves its capabilities to statistically compare the factorial structure among the manifest indicators and latent constructs in a given model across multiple groups of participants (Little, 1997), in this case across boys and girls. Prior to testing the gender differences in the structural model, the measurement equivalence of the intercepts and loadings of the manifest indicators on the latent constructs across boys and girls was examined. Establishing measurement invariance between boys and girls using SEM then allowed for testing of the similarities and differences between them in the variances and covariances, correlations, means, and structural relationships among the latent constructs.

Results

Preliminary Analyses

Descriptive properties of the variables. Means and standard deviations for the manifest variables and the bivariate correlations among these variables are shown in Table 2 for the overall sample and in Appendix A, Table 10 by gender. Peer-related social stress was negatively correlated with global self-esteem and positively correlated with the coping and involuntary stress responses thought to be less healthy (i.e., disengagement coping, involuntary engagement, and involuntary disengagement). Notably, peer-related social stress was positively correlated with alcohol use. Additionally, global self-esteem was positively related to primary and secondary engagement coping but negatively related to disengagement coping, involuntary engagement, and involuntary disengagement, suggesting that adolescents who experience lower self-esteem also engage in less effective coping strategies and

Table 2

Means, Standard Deviations, and Correlations Between the Manifest Variables

	Peer Stress	Self-Esteem	Coping			Involuntary Stress Responses		Alcohol Expectancies		Alcohol Use
Variable	1	2	3	4	5	6	7	8	9	10
1. Peer-Related Social Stress	--									
2. Global Self-Esteem	-.18*	--								
3. Primary Engagement Coping	-.04	.24**	--							
4. Secondary Engagement Coping	.06	.26**	.49***	--						
5. Disengagement Coping	.16*	-.35***	.10	.18*	--					
6. Involuntary Engagement	.16*	-.38***	.30***	.18*	.58***	--				
7. Involuntary Disengagement	.16*	-.41***	.11	.13	.67***	.81***	--			
8. Sociability Expectancies	.15	.09	.19*	.11	.08	.04	-.02	--		
9. Tension Reduction Expectancies	.09	.04	-.12	.02	.01	-.08	.04	.51***	--	
10. Alcohol Use	.28***	-.14	-.01	-.10	.09	.19*	.14	.36***	.30***	--
M	14.82	3.33	2.53	2.53	2.04	1.97	1.73	3.05	2.53	.00
SD	16.24	.62	.62	.53	.49	.64	.53	.78	.86	.87

Note. The Alcohol Use items were standardized to put them on the same metric prior to creating the aggregate variable.
* $p < .05$. ** $p < .01$. *** $p < .001$.

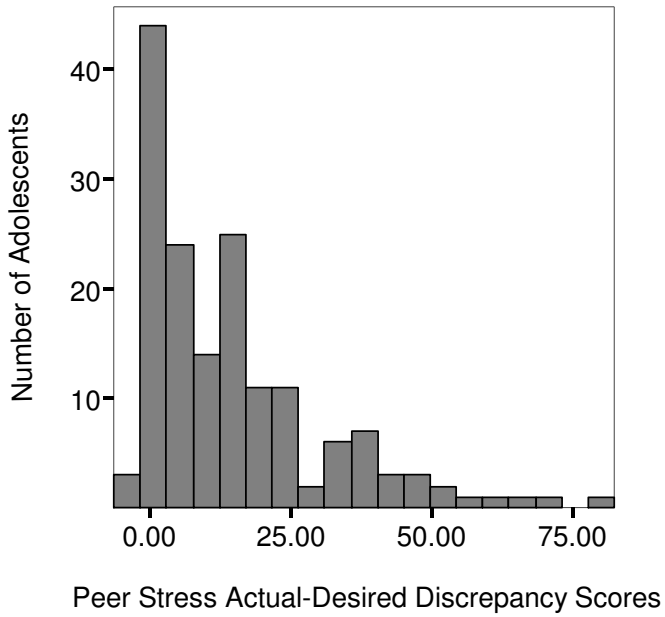
experience involuntary responses to social stress. The correlations among the three types of coping and two types of involuntary stress responses replicated most of the relations typically found in previous research (Connor-Smith et al., 2000). As expected, sociability and tension reduction positive expectancies were strongly correlated and were each significantly positively related to alcohol use.

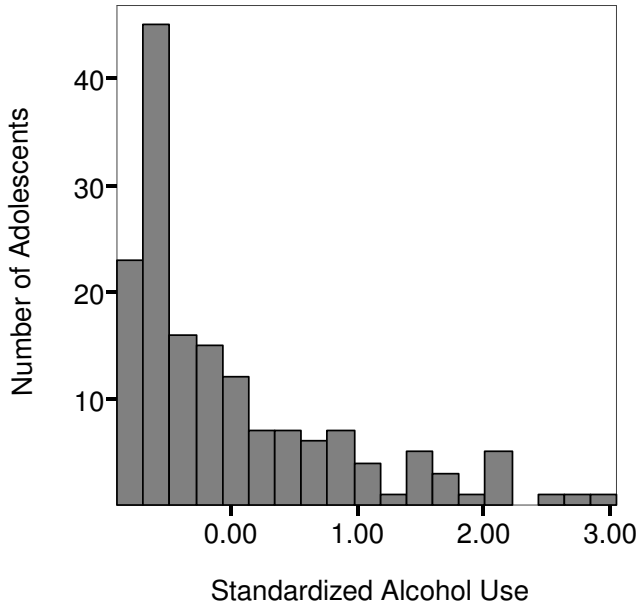
Closer examination of the distributional properties of the peer-related social stress variable indicated that there was sufficient variability among adolescents in the degree to which they were satisfied with their current level of belonging within their top two most desired social crowds (range = -6.44 to 82.50; see Figure 2). Similarly, adolescents also varied in their levels of reported alcohol use (standardized range = -.90 to 3.06; see Figure 2). Moreover, the percentages of adolescents in the present sample who reported having consumed alcohol and having been drunk within their lifetimes nearly paralleled national averages. While national percentages suggest that 63-75% of 10th graders have consumed alcohol (Eaton et al., 2006; Johnston et al., 2006), 60.0% of adolescents in the present sample reported having consumed alcohol for reasons other than religious services. Of the 160 adolescents in the present sample, 42.5% also reported having been drunk at least once, a percentage that mirrors the national average of 42% of 10th graders who reported having been drunk (Johnston et al., 2006).

Preliminary multiple regression analyses. Structural equation models are best informed by first examining the relationships among variables of interest using multiple regression procedures, so as to not overcomplicate a model and create

Figure 2

Histograms for Peer-Related Social Stress and Alcohol Use Manifest Variables





estimation problems by including constructs not statistically related. With respect to the present investigation, a series of multiple regression analyses was conducted to determine the importance of including various construct main effects and moderated relations in the final SEM models. Each multiple regression analysis included two main effects and the multiplicative interaction term for those two main effects to represent the moderated relation (see Table 3; Baron & Kenny, 1986; Holmbeck, 1997). Residual centering was used to create interaction terms to avoid problems of multicollinearity that can lead to instable parameter estimates when estimating interaction terms highly correlated with first order terms (Lance, 1988; Little, Bovaird, et al., 2006). Given the large number of regression analyses, the *p* value was reduced from .05 to .01 to reduce the likelihood of Type I error potentially associated with conducting large numbers of analyses.

The results of the series of regression analyses are presented in Table 3. Across the 14 regression analyses, the main effects for peer-related social stress, involuntary engagement stress responses, sociability alcohol expectancies, and tension reduction alcohol expectancies emerged as significantly predictive of alcohol use. Contrary to expectations, the main effects for global self-esteem and disengagement coping were not significantly predictive of alcohol use. The interaction between peer-related social stress and global self-esteem was significantly predictive of alcohol use as hypothesized, meaning that adolescents' global self-esteem moderates the relation between peer-related social stress and alcohol use. However, none of the other interactions tested were significant in their prediction of

Table 3
Summary of Preliminary Regression Analyses for Variables Predicting Alcohol Use

Variable	ΔR^2	β	Variable	ΔR^2	B
Step 1	.07**		Step 1	.06**	
Peer-Related Social Stress		.26**	Peer-Related Social Stress		.28***
Global Self-Esteem		-.10	Primary Control Engagement Coping		.00
Step 2	.05**		Step 2	.03*	
PRSS x Global Self-Esteem		.22**	PRSS x PCEC		.16*
Total *F* (3,156) = 7.97***			Total *F* (3,156) = 5.82**		

Variable	ΔR^2	β	Variable	ΔR^2	B
Step 1	.08**		Step 1	.07**	
Peer-Related Social Stress		.28***	Peer-Related Social Stress		.27**
Secondary Control Engagement Coping		-.12	Disengagement Coping		.05
Step 2	.03*		Step 2	.01	
PRSS x SCEC		.16*	PRSS x DC		.10
Total *F* (3,156) = 6.80***			Total *F* (3,156) = 5.01**		

Variable	ΔR^2	β	Variable	ΔR^2	B
Step 1	.09***		Step 1	.08**	
Peer-Related Social Stress		.25**	Peer-Related Social Stress		.26**
Involuntary Engagement Coping		.15	Involuntary Disengagement Coping		.10
Step 2	.03*		Step 2	.00	
PRSS x IEC		.17*	PRSS x IDC		.04
Total *F* (3,156) = 7.55***			Total *F* (3,156) = 5.02**		

table continues

Variable	ΔR^2	β	Variable	ΔR^2	B
Step 1	.17***		Step 1	.14***	
Peer-Related Social Stress		.23**	Peer-Related Social Stress		.25**
Sociability Positive Alcohol Expectancy		.32***	Tension Reduction Positive Alcohol Expectancy		.28***
Step 2	.01		Step 2	.00	
PRSS x Sociability		.08	PRSS x Tension Reduction		-.01
Total *F* (3,156) = 11.82***			Total *F* (3,156) = 9.38***		

Variable	ΔR^2	β	Variable	ΔR^2	B
Step 1	.12***		Step 1	.14***	
Primary Control Engagement Coping		-.08	Secondary Control Engagement Coping		-.14
Sociability Positive Alcohol Expectancy		.37***	Sociability Positive Alcohol Expectancy		.37***
Step 2	.00		Step 2	.00	
PCEC x Sociability		.01	SCEC x Sociability		.02
Total *F* (3,156) = 8.05***			Total *F* (3,156) = 9.04***		

Variable	ΔR^2	β	Variable	ΔR^2	B
Step 1	.15***		Step 1	.09***	
Involuntary Engagement Coping		.18*	Disengagement Coping		.09
Sociability Positive Alcohol Expectancy		.35***	Tension Reduction Positive Alcohol Expectancy		.30***
Step 2	.01		Step 2	.00	
IEC x Sociability		.08	DC x Tension Reduction		-.02
Total *F* (3,156) = 10.34***			Total *F* (3,156) = 5.72**		

table continues

Variable	ΔR^2	β	Variable	ΔR^2	β
Step 1	.13***		Step 1	.10***	
Involuntary Engagement Coping		.22**	Involuntary Disengagement Coping		.13
Tension Reduction Positive Alcohol Expectancy		.32***	Tension Reduction Positive Alcohol Expectancy		.30***
Step 2	.00		Step 2	.02	
IEC x Tension Reduction		.06	IDC x Tension Reduction		.12
Total F (3,156) = 8.56***			Total F (3,156) = 7.26***		

Note. A Bonferroni correction was used to reduce the likelihood of Type I error because of the large number of regression equations. For both main effects and interactions, $p < .01$, was used to establish statistical significance.

* $p < .05$. ** $p < .01$. *** $p < .001$.

alcohol use. Specifically, the two hypothesized interactions between (1) primary control engagement coping and sociability alcohol expectancies and (2) disengagement coping and tension reduction alcohol expectancies were not related to alcohol use. In summary, based on the results of the preliminary regressions, main effect terms for peer-related social stress, global self-esteem, involuntary engagement stress responses, sociability alcohol expectancies, and tension reduction expectancies, as well as a peer-related social stress × global-self esteem interaction term, were included as predictors of alcohol use in multivariate SEM analyses (see below). Although the main effect for global self-esteem was not found to independently predict alcohol use in the preliminary regressions, it was included as a main effect term in SEM analyses due to its involvement in the hypothesized social stress-self esteem interaction.

SEM Analyses for the Overall Sample

Procedures for identifying indicators of latent constructs. One of the most prominent benefits of SEM involves its capabilities to account for measurement error when producing parameter estimates. This benefit is made possible by modeling multiple manifest indicators of each latent construct of interest. Several different procedures were used to create indicators for the seven different latent constructs included in the SEM models. First, the two actual-desired peer crowd belonging discrepancy score variables for (1) the peer crowd within which adolescents most desired to belong and (2) the second most desired peer crowd were used as two separate indicators of the latent peer-related social stress construct. Similarly, given

that the Comprehensive Effects of Alcohol questionnaire (CEOA; Fromme et al., 1993) includes 3 items to assess tension reduction positive alcohol expectancies, these 3 items were used as 3 indicators of the latent tension reduction construct.

Second, item-to-construct balance procedures were used to create three parcels each to serve as indicators of the global self-esteem, sociability alcohol expectancies, and alcohol use constructs, respectively (see Little, Cunningham, Shahar, & Widaman, 2002). Parceling is a technique whereby sets of items are averaged to form single aggregate manifest indicators. Some of the statistical benefits to parceling include improved distributional qualities (e.g., less skew), greater parsimony and reliability, and lower likelihood of correlated residuals and dual factor loadings (Little et al., 2002). The global self-worth subscale of the Self-Perception Profile for Adolescents (SPPA; Harter, 1988) includes 5 items to measure adolescents' global self-worth. Item-total correlations were calculated for these 5 items, and the relative correlations guided the separation of the items into 3 separate balanced indicators (i.e., 2 parcels with 2 items each, 1 single-item indicator). Item-total correlations calculated among the three resulting indicators suggested that the parcels and the single-item indicator were adequately balanced (item-total correlations = 0.80, 0.72, 0.68). The same procedure was used to guide the separation of the 8 sociability expectancy items from the Comprehensive Effects of Alcohol questionnaire (CEOA; Fromme et al., 1993) into 3 balanced parcels (i.e., 2 parcels with 3 items each, 1 parcel with 2 items). Item-total correlations calculated among the three resulting parcels suggested that these parcels were also adequately balanced

(item-total correlations = 0.78, 0.76, 0.75). Furthermore, the same procedures were again used to separate the 6 alcohol use items into 3 balanced parcels (i.e., 3 parcels with 2 items each; item-total correlations = .92, .85, .84).

Third, with respect to involuntary engagement stress responses, a priori questionnaire construction guided the calculation of parcels (see discussion of this method in Little et al., 2002). The 15 items measuring involuntary engagement with social stress were separated into 5 different averaged 3-item parcels (i.e., rumination, intrusive thoughts, emotional arousal, physiologic arousal, and impulsive action) specified a priori in the development and validation of the Responses to Stress Questionnaire (RSQ; Connor-Smith et al., 2000).

Finally, orthogonalizing procedures outlined by Little, Bovaird and colleagues (2006) were implemented to model the peer-related social stress × global self-esteem interaction term in the SEM framework. Of the various procedures developed to conduct this type of SEM analysis, this method is considered to be the most parsimonious and accessible to applied researchers (see Little, Bovaird, et al., 2006). This procedure initially involved calculating all possible product terms among the 5 indicators of the two constructs involved in the interaction, resulting in 6 product terms. The second portion of this orthogonalizing procedure involved regressing each of the 6 product terms onto the 5 first-order indicators of the two constructs involved. The 6 resulting residuals from these regression procedures were then saved and used as the indicators of the latent interaction. The orthogonalization of the interaction term from its two main effect factors was maintained in the overall model by not

allowing the latent interaction term to covary with either of the two latent constructs involved in the interaction. There was a pattern of indicator residuals allowed to correlate for each of the latent interaction terms to account for the shared variance among the residuals for product terms that shared one of the same first-order indicators (see Tables 4 and 5 for this pattern of correlated residuals).

Procedures for assessing model fit and interpreting results. The combination of assessing overall model fit to the data and the interpretation of significant main effect and interaction parameters was utilized to yield the richest interpretation of the results of the SEM analyses. Overall model fit was assessed using standard measures of fit: (a) the Root Mean Squared Error of Approximation (RMSEA), for which a value below .08 is generally deemed acceptable and below .05 is generally deemed very good; (b) the Non-Normed Fit Index (NNFI) and (c) the Comparative Fit Index (CFI) – for these fit indexes, a value above .90 is generally deemed acceptable and above .95 is generally deemed very good. Additionally, the significance of the beta parameters calculated to represent the strength of the relations between each of the six independent latent variables and alcohol use was tested using procedures outlined by Gonzalez and Griffin (2001). Specifically, a series of nested chi-square difference tests were conducted to assess the difference in overall model fit when a given beta parameter was estimated compared to when it was constrained to zero. The significance of these chi-square difference tests represented the significance of each latent independent variable in predicting alcohol use. Those latent variables whose

beta parameters were not found to indicate significant relationships with alcohol use were subsequently removed from the final models.

Results of the structural model in the overall sample. The structural model constructed to examine the degree to which each of the six latent independent variables (peer-related social stress, global self-esteem, peer-related social stress × global self-esteem, involuntary engagement, sociability alcohol expectancies, and tension reduction alcohol expectancies) simultaneously contributed to the prediction of alcohol use demonstrated acceptable model fit ($\chi^2_{(139, n = 160)} = 233.68$, RMSEA = .065 $_{(.050; .079)}$, NNFI = 0.946, CFI = 0.956). However, nested chi-square tests indicated that three of the latent independent variables did not significantly predict alcohol use: global self-esteem ($\Delta\chi^2_{(1, n = 160)} = .51$, $p = .48$), involuntary engagement stress responses ($\Delta\chi^2_{(1, n = 160)} = .39$, $p = .53$), and tension reduction alcohol expectancies ($\Delta\chi^2_{(1, n = 160)} = .37$, $p = .55$). These three latent regression paths were subsequently removed from the model.

The simplified and final model that reflected the removal of all non-significant latent structural paths included three latent independent variables (i.e., peer-related social stress, peer-related social stress × global self-esteem, and sociability alcohol expectancies) and did not differ in fit from the saturated model ($\Delta\chi^2_{(3, n = 160)} = 1.71$, $p = .63$). Table 4 provides the loadings, intercepts, residuals, and R^2 values for each indicator, and Table 5 includes the correlated residuals among the indicators of the latent interaction term. The standardized variance-covariance matrix among the latent variables is presented in Table 6. When the latent variance-

Table 4
Loading and Intercept Values, Residuals, and R^2 Values for Each Indicator, and the Estimated Latent Variance from the Structural Model for the Overall Sample

Indicator	LISREL Estimates *Loading (SE)*	*Intercept (SE)*	Standardized *Loading*[a]	*Theta*	R^2
Peer-Related Social Stress: Estimated Latent Variance = 141.76					
Parcel 1	1.00	--	.53	368.45	.28
Parcel 2	1.00	--	.74	117.40	.55
Global Self-Esteem: Estimated Latent Variance = .33					
Parcel 1	1.16 (.06)	-.62 (.19)	.91	.09	.83
Parcel 2	.90 (.05)	.34 (.17)	.81	.15	.65
Parcel 3	.94 (.06)	.28 (.19)	.74	.24	.55
Peer-Related Social Stress × Global Self-Esteem: Estimated Latent Variance = 1.00					
Product term 1 (1,1)	11.32 (2.13)	.00 (1.28)	.70	132.50	.49
Product term 2 (1,2)	7.36 (1.68)	.00 (1.00)	.58	104.73	.34
Product term 3 (1,3)	7.06 (1.85)	.00 (1.13)	.50	153.72	.25
Product term 4 (2,1)	3.16 (1.64)	.00 (1.16)	.22	202.65	.05
Product term 5 (2,2)	3.97 (.93)	.00 (.69)	.46	59.49	.21
Product term 6 (2,3)	3.66 (1.11)	.00 (.83)	.35	96.61	.12
Involuntary Engagement: Estimated Latent Variance = .36					
Rumination	1.10 (.06)	-.16 (.13)	.83	.19	.69
Intrusive Thoughts	1.08 (.07)	-.29 (.14)	.79	.24	.63
Emotional Arousal	1.16 (.06)	-.11 (.13)	.85	.19	.72

table continues

Physiological Arousal	.84 (.06)	.01 (.13)	.73	.23	.53
Impulsive Action	.83 (.10)	.55 (.19)	.53	.61	.28
Sociability Alcohol Expectancies: Estimated Latent Variance = .52					
Parcel 1	.96 (.05)	.05 (.16)	.80	.28	.63
Parcel 2	1.07 (.05)	-.20 (.15)	.90	.13	.82
Parcel 3	.97 (.05)	.14 (.16)	.81	.27	.65
Tension Reduction Alcohol Expectancies: Estimated Latent Variance = .55					
Item 1	1.02 (.08)	-.18 (.21)	.70	.59	.49
Item 2	1.05 (.08)	.19 (.21)	.75	.46	.57
Item 3	.94 (.08)	-.01 (.21)	.67	.59	.45
Alcohol Use: Estimated Latent Variance = .71					
Parcel 1	.96 (.03)	.00 (.03)	.88	.19	.78
Parcel 2	1.05 (.03)	.00 (.02)	.99	.02	.97
Parcel 3	.99 (.03)	.00 (.03)	.87	.22	.76

[a] Completely Standardized Solution

Table 5

Correlated Residuals Between Orthogonalized Product Term Indicators of the Latent Peer-Related Social Stress × Global Self-Esteem Interaction in the Structural Model for the Overall Sample

Correlated Residual	Peer-Related Social Stress × Global Self-Esteem *Theta*
Product term 2, Product term 1	47.33
Product term 3, Product term 1	87.16
Product term 3, Product term 2	55.05
Product term 5, Product term 4	72.31
Product term 6, Product term 4	90.83
Product term 6, Product term 5	48.07
Product term 4, Product term 1	-17.85
Product term 5, Product term 2	13.65
Product term 6, Product term 3	19.37

Table 6

Completely Standardized Psi Matrix for the Latent Constructs in the Structural Model for the Overall Sample

	Peer-Related Social Stress	Global Self-Esteem	P-R Stress × Self-Esteem	Involuntary Engagement	Sociability Expectancies	Tension Reduce Expectancies	Alcohol Use
Peer-Related Social Stress	1.00						
Global Self-Esteem	-.29**	1.00					
P-R Stress × Self-Esteem	- -	- -	1.00				
Involuntary Engagement	.25*	-.42***	.02	1.00			
Sociability Expectancies	.16	.10	.05	.03	1.00		
Tension Reduce Expectancies	.08	.07	.28*	-.15	.67***	1.00	
Alcohol Use	--	--	--	--	--	--	.59

Note. * $p < .05$. ** $p < .01$. ***$p < .001$.

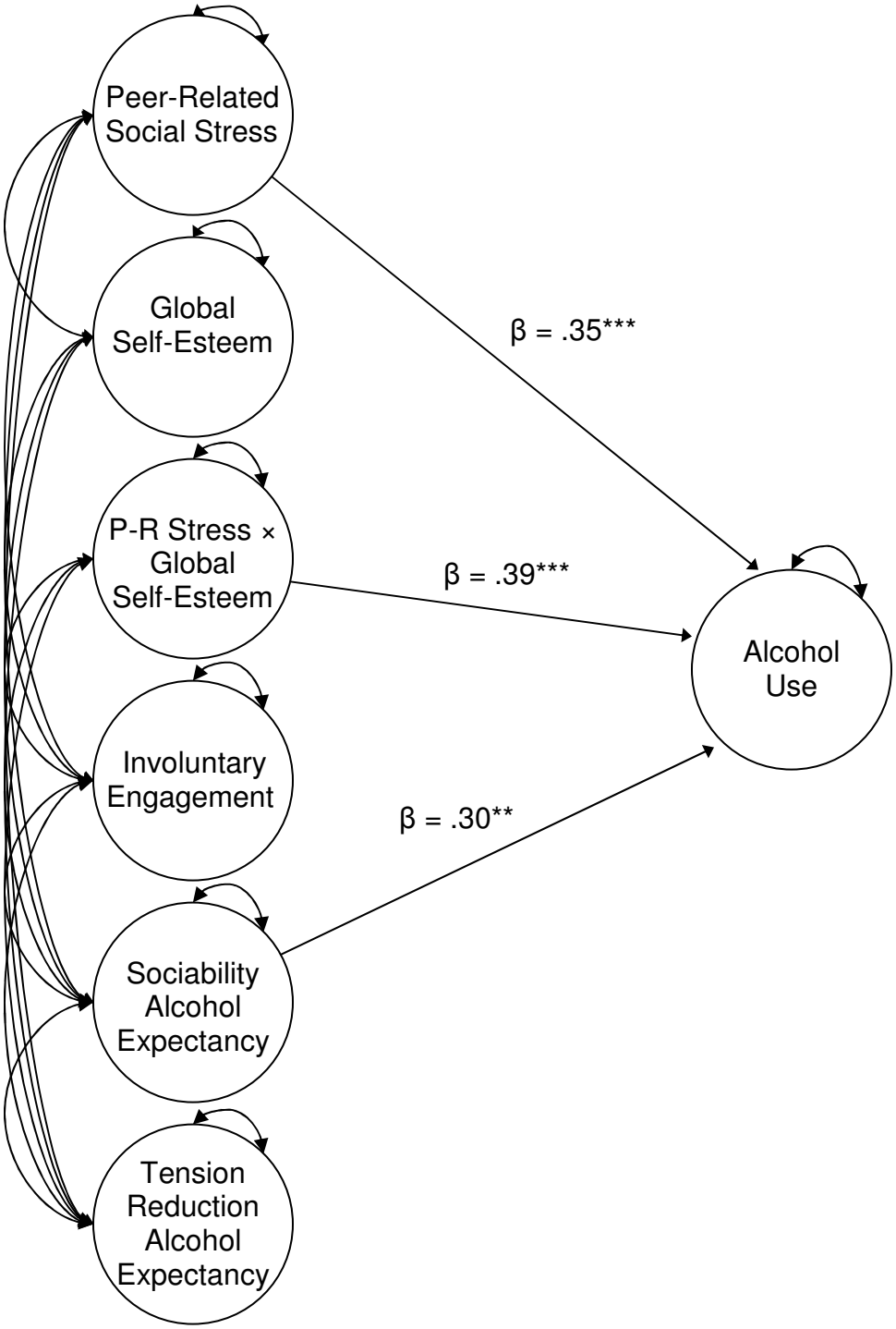
covariance matrix is standardized as it was here, the covariance values can be used to assess the correlations among the latent independent variables. In the structural model, global self-esteem was negatively related to peer-related social stress and involuntary engagement stress responses. Sociability and tension reduction alcohol expectancies were strongly correlated.

Most pertinent to the substantive hypotheses in the present study, Figure 3 presents the beta coefficients for each of the structural paths predicting alcohol use. Overall, the 3 significant constructs combined to predict 41% of the variance in alcohol use. Adolescents experiencing higher levels of peer-related social stress were significantly more likely to report alcohol use ($\beta = .35$, $p < .001$). Additionally, the significance of the peer-related social stress × global self-esteem interaction term indicated that global self-esteem remained a moderator of peer-related social stress and alcohol use ($\beta = .39$, $p < .001$). Further, adolescents who endorsed sociability alcohol expectancies were also significantly more likely to report alcohol use ($\beta = .30$, $p < .01$). Procedures outlined by Aiken and West (1991) were used to probe the significant peer-related social stress × global self-esteem interaction (see Figure 4). Compared to adolescents with lower global self-esteem, adolescents with higher self-esteem were more likely to consume alcohol when also experiencing higher levels of peer-related social stress. Adolescents with lower global self-esteem were less likely to consume alcohol when experiencing similar levels of peer-related stress.

Two-Group SEM Analyses Examining Gender Differences

The following sequential, nested tests were conducted to establish

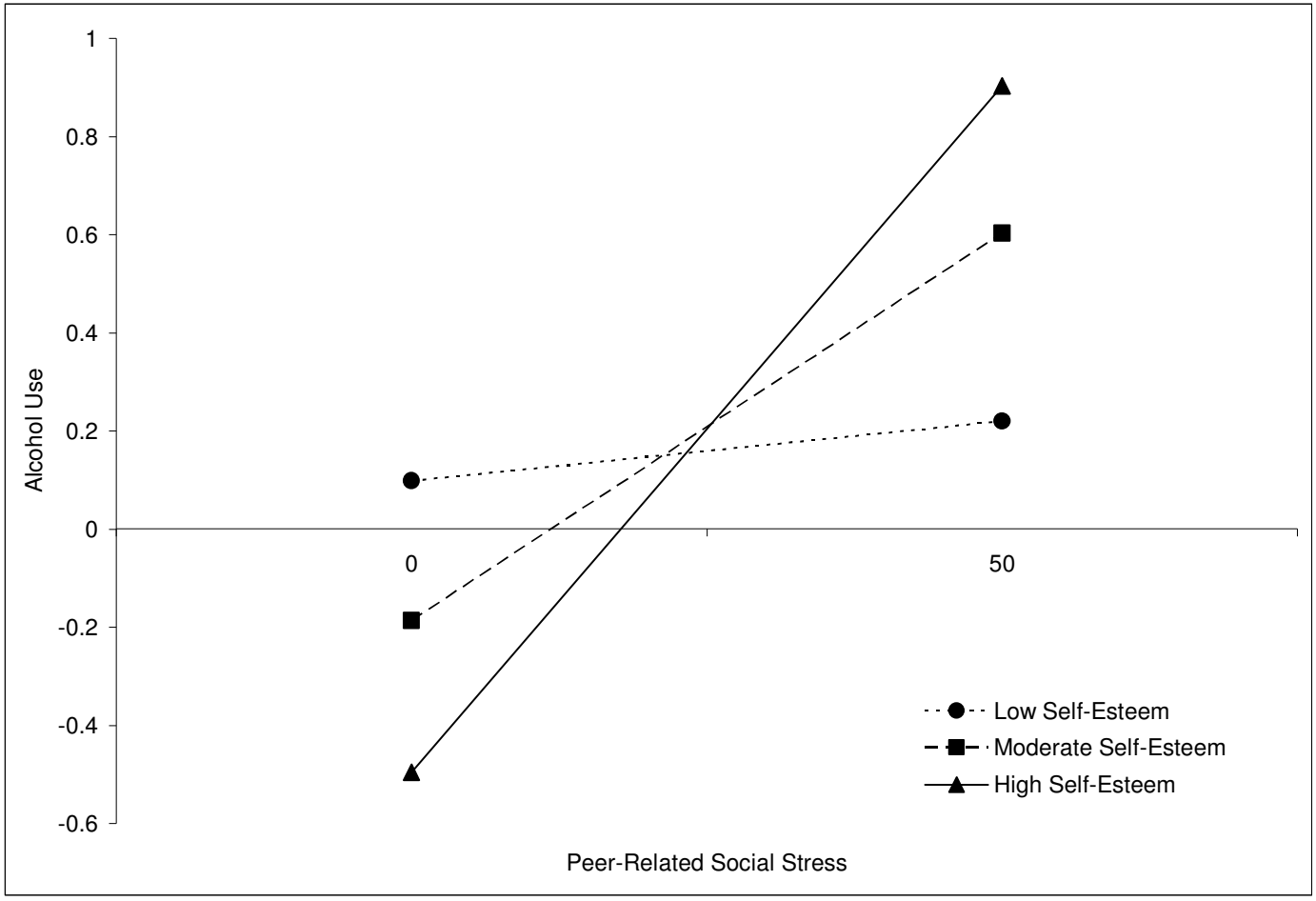
Figure 3
Final Structural Model for the Overall Sample



Note. Beta paths not depicted were non-significant and were removed from the final model. ** $p < .01$. *** $p < .001$.

Figure 4

Graphical Representation of Global Self-Esteem as a Moderator of Peer-Related Social Stress and Alcohol Use



measurement equivalence across boys and girls prior to examining any structural sex differences in the relationships among the latent constructs in the simplified model: (a) a test of configural invariance that evaluated whether the pattern of fixed and free model parameters was equivalent across boys and girls, (b) a test of weak (loading) invariance that evaluated whether the relative factor loadings, or loadings of the manifest indicators on the latent constructs, were equivalent across boys and girls, (c) a test of strong (intercept) invariance that evaluated whether the relative indicator means, or loading intercepts, were equal across boys and girls, and (d) a test of the homogeneity of the variances and covariances among the latent constructs across boys and girls. Measurement equivalence was established in each of these four sequential tests using the RMSEA model test (i.e., determining whether the RMSEA for each nested model fell within the 90% confidence interval of the RMSEA for the previous comparison test in the nested sequence) and the χ^2 difference test (see Table 7). The initial configural model demonstrated adequate fit ($\chi^2_{(276,\ n = 160)} = 383.90$, $\text{RMSEA} = .062_{(.042;\ .079)}$, NNFI = 0.938, CFI = 0.950), and the tests that followed indicated that the latent constructs included in the model had the same factorial structure among both boys and girls. The loading, intercept, residual, and R^2 values for each indicator, as well as the variance of each latent construct, for both boys and girls from the strong (intercept) invariant model are presented in Table 8.

Upon establishing measurement equivalence between boys and girls, the invariance of the correlations among the latent constructs and the means of the latent constructs were tested in additional nested tests (see Table 7). Neither the latent

correlations nor the latent means for any of the constructs were found to differ between boys and girls ($\Delta\chi^2_{(15,\ n = 160)} = 13.55$, $p = .56$, and $\Delta\chi^2_{(6,\ n = 160)} = 10.08$, $p = .12$, respectively), meaning that the latent constructs of interest were similarly related between boys and girls and that the means of each construct were not significantly different between boys and girls. Furthermore, the structural model for boys and girls demonstrated adequate fit ($\chi^2_{(301,\ n = 160)} = 405.96$, RMSEA = .058 $_{(.038;\ .075)}$, NNFI = 0.945, CFI = 0.951), and when the same non-significant paths were removed from the 2-group gender model (i.e., global self-esteem, involuntary engagement stress responses, and tension reduction alcohol expectancies), the model fit was not different from the saturated model ($\Delta\chi^2_{(6,\ n = 160)} = 3.83$, $p = .70$). The remaining latent independent variables (i.e., peer-related social stress, the peer-related social stress × global self-esteem interaction, and sociability alcohol expectancies) predicted 32% of the variance in alcohol use among boys and 49% of the variance in alcohol use among girls. Peer-related social stress and the peer-related social stress × global self-esteem interaction term significantly predicted alcohol use for both boys and girls (see Table 9). Sociability alcohol expectancies were only related to alcohol use among boys; however, nested chi-square tests indicated that there were no statistically significant gender differences in the magnitudes of the latent regression paths.

Table 7

Fit Indices for the Nested Sequence in the Multiple Group Confirmatory Factor Analysis

Model	χ^2	*df*	*p*	$\Delta\chi^2$	Δ *df*	*p*	RMSEA	RMSEA 90% CI	NNFI	CFI	Constraint Tenable
Measurement Parameter Tests:											
Configural Invariance	383.90	276	<.001	---	---	---	.062	.042-.079	0.938	0.950	---
Loading Invariance[1,2]	398.31	288	<.001	14.41	12	=.28	.061	.042-.078	0.939	0.949	yes
Intercept Invariance[1,2]	405.96	301	<.001	7.65	13	=.87	.058	.038-.075	0.945	0.951	yes
Latent Parameter Tests:											
Homogeneity of Variances/Covariances[2]	423.46	322	<.001	17.50	21	=.68	.055	.035-.072	0.950	0.953	yes
Equality of Correlations[2,3]	411.77	303	<.001	13.46	15	=.57	.059	.040-.076	0.943	0.950	yes
Equality of Correlations[2,4]	419.51	316	<.001	13.55	15	=.56	.056	.036-.073	0.948	0.952	yes
Latent Mean Invariance[2]	416.04	307	<.001	10.08	6	=.12	.059	.039-.076	0.944	0.950	yes

[1] Evaluated with the RMSEA Model Test
[2] Evaluated with the χ^2 Difference Test
[3] Evaluated with the χ^2 Difference Test relative to Weak Invariance model (mean constraints are not included)
[4] Evaluated with the χ^2 Difference Test relative to Strong Invariance model (mean constraints are included)

Note. Each nested model contains its constraints, plus the constraints of all previous, tenable models.

Table 8

Loading and Intercept Values, Residuals, and R^2 Values for Each Indicator, and the Estimated Latent Variance from the 2-Group Gender Intercept Invariance Model

Indicator	Equated LISREL Estimates		Standardized	Boys		Girls	
	Loading (SE)	*Intercept (SE)*	*Loading*[a]	*Theta*	R^2	*Theta*	R^2
Peer-Related Social Stress: Estimated Latent Variance (Boys = 163.79; Girls = 142.41)							
Parcel 1	1.00	2.72 (0.77)	0.55	226.22	0.42	511.94	0.22
Parcel 2	1.00	-2.72 (0.77)	0.78	43.85	0.79	172.46	0.45
Global Self-Esteem: Estimated Latent Variance (Boys = .29; Girls =.40)							
Parcel 1	1.16 (0.05)	-0.61 (0.18)	0.91	0.04	0.91	0.17	0.76
Parcel 2	0.90 (0.05)	0.35 (0.17)	0.81	0.16	0.59	0.12	0.73
Parcel 3	0.94 (0.06)	0.26 (0.19)	0.75	0.24	0.52	0.23	0.61
Involuntary Engagement: Estimated Latent Variance (Boys = .33; Girls = .41)							
Rumination	1.08 (0.06)	-0.13 (0.13)	0.83	0.17	0.69	0.22	0.68
Intrusive Thoughts	1.08 (0.07)	-0.29 (0.13)	0.80	0.26	0.60	0.22	0.69
Emotional Arousal	1.14 (0.06)	-0.08 (0.13)	0.84	0.20	0.68	0.20	0.73

table continues

Physiological Arousal	0.84 (0.06)	0.01 (0.13)	0.73	0.23	0.50	0.21	0.58
Impulsive Action	0.86 (0.09)	0.49 (0.19)	0.55	0.51	0.32	0.74	0.29
Sociability Alcohol Expectancies: Estimated Latent Variance (Boys = .58; Girls = .43)							
Parcel 1	0.96 (0.05)	0.06 (0.16)	0.79	0.26	0.67	0.31	0.56
Parcel 2	1.07 (0.05)	-0.19 (0.15)	0.90	0.15	0.81	0.12	0.81
Parcel 3	0.98 (0.05)	0.13 (0.16)	0.80	0.28	0.66	0.25	0.62
Tension Reduction Alcohol Expectancies: Estimated Latent Variance (Boys = .55; Girls = .55)							
Item 1	1.04 (0.08)	-0.23 (0.21)	0.72	0.53	0.53	0.62	0.49
Item 2	1.03 (0.08)	0.24 (0.20)	0.74	0.46	0.56	0.51	0.53
Item 3	0.93 (0.08)	-0.01 (0.21)	0.67	0.61	0.44	0.57	0.46
Alcohol Use: Estimated Latent Variance (Boys = .73; Girls = .70)							
Parcel 1	0.96 (0.03)	0.00 (0.03)	0.89	0.17	0.80	0.20	0.76
Parcel 2	1.05 (0.03)	0.00 (0.02)	0.99	0.03	0.97	0.02	0.98
Parcel 3	0.99 (0.03)	0.00 (0.03)	0.87	0.25	0.74	0.19	0.79

[a] Common Metric Completely Standardized Solution

Table 9

Beta Parameters for Boys and Girls in Latent 2-Group Model Predicting Alcohol Use and Results of Nested Chi-Square Tests for Gender Differences in Beta Parameters

Constructs	β Boys	β Girls	χ^2	*df*	*p*	$\Delta\chi^2$	Δ *df*	*p*	Equivalent Across Groups
2-Group Structural Model (Baseline Model)	---	---	675.87	533	=.000	---	---	---	
Peer-Related Social Stress	0.25*	0.48**	677.13	534	=.000	1.26	1	=.26	Yes
P-R Stress × Self-Esteem	0.27*	0.45**	677.27	534	=.000	1.40	1	=.24	Yes
Sociability Alcohol Expectancies	0.43***	0.13	678.06	534	=.000	2.19	1	=.14	Yes

Note. Indicators of significance in the columns presenting beta parameters for boys and girls separately indicate those beta parameters for each gender that were statistically significant in the prediction of alcohol use. Equivalency across groups indicates an absence of gender differences in the beta parameters for each construct.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

The purpose of this study was to examine a comprehensive model of additive risk factors for alcohol use among a school-based sample of 10th grade adolescents in their first semester after transitioning to the high school building. Among the risk factors expected to contribute to alcohol use were (a) peer-related social stress, a newly conceptualized construct that aimed to capture the degree to which adolescents were dissatisfied with their peer crowd belonging, and (b) several emotional and cognitive constructs (i.e., lower global self-esteem, coping strategies, and alcohol expectancies) previously found to relate to alcohol use but not previously examined in combination within a social developmental model. Additionally, several of the risk factors were expected to moderate relationships between other risk factors and alcohol use: adolescents with lower self-esteem were expected to have a higher likelihood of peer-related social stress contributing to alcohol use; adolescents who endorsed sociability alcohol expectancies were expected to be more likely to have primary control engagement coping with social stress lead to alcohol use; and adolescents who endorsed tension reduction alcohol expectancies were expected to be more likely to have disengagement coping with social stress lead to alcohol use.

As predicted, the findings indicated that peer-related social stress and sociability positive alcohol expectancies related significantly to adolescent alcohol use. Also in line with expectations, self-esteem moderated the relation between peer-related social stress and alcohol use. However, higher peer-related stress was more strongly related to alcohol use among adolescents who had higher levels of self-

esteem, whereas peer stress was less associated with alcohol use among adolescents with lower self-esteem. Adolescents' coping styles were not associated with their alcohol use, and there were no gender differences in any of the study findings.

Peer-Related Social Stress and Alcohol Use

The emergence of peer-related social stress as a strong predictor of adolescent alcohol use in this study points to adolescents' perceptions of their relative social belonging in desired peer crowds as an important consideration in understanding the social complexities involved in underage drinking. Notably, peer-related social stress remained a strong contributor to alcohol use even when also considering adolescents' positive alcohol expectancies, a cognitive construct that has garnered extensive recognition in both the adolescent and adult alcohol use literatures as an important influence on drinking decisions (Earlywine, 1994; Fromme & D'Amico, 2000; Goldberg et al., 2002; Goldman et al., 1999). Not only did peer-related social stress contribute to adolescent alcohol use at a similar magnitude as other previously recognized predictors of alcohol use, but it appears to have done so among a school-based sample of adolescents following the high school transition common to the adolescent experience. Specifically, this time often encompasses shifts in friendships (Aikins et al., 2005), greater diversity of peer crowds (Kinney, 1993), and increased access to alcohol and other substances (Harrison, Falkerson, & Park, 2000). Placing the findings within this population and these developmental circumstances is consistent with the recent NIAAA call for comprehensive models of adolescent alcohol use among "mainstream and successful" adolescents (Psychosocial Processes,

2004/2005). While these findings point to a social experience and potential stressor likely to be experienced to different degrees by many adolescents at the high school transition, the findings can be contrasted with conceptual models common to antisocial and delinquent youth, who have also been found to use substances to increase social belonging, yet under different and less common circumstances (i.e., to afford mutual affiliation among adolescents previously rejected by mainstream peers; Moffit, 1993).

In addition to underscoring the importance of considering adolescents' peer-related social stress in the development of comprehensive models of mainstream adolescent alcohol use, the present study extended the previous literature in two other ways. First, while the peer context has been considered crucial for understanding many aspects of adolescent development and risk behavior (Urberg et al., 1997), examination of peer-related social stress addressed a less explored and less direct aspect of peer influence, in this case when applied to drinking decisions. Previous research has focused on more observable social affiliations and behaviors in anticipating adolescents' own alcohol use (i.e., adolescents with best friends or fellow peer crowd members who drink are more likely to drink themselves; Hawkins et al., 1992; La Greca et al., 2001; Sussman et al., 2000; Wills & Cleary, 1999); however, this study adds to this literature by assessing adolescents' social cognitive perceptions of and satisfaction with the level of their peer crowd affiliations and social belonging. This is a crucial consideration during a time that adolescent cognitive and social development leads to heightened introspection (Hansell, Mechanic, & Brondolo,

1986) and increased salience of peers' approval (O'Brien & Bierman, 1988). Furthermore, this study complements recent work examining other aspects of adolescents' social cognitive experiences and risk behavior (see Prinstein & Cohen, 2006; and Prinstein et al., 2003 for work on adolescents' perceptions of risk behavior among higher status peers). Together, these lines of research highlight the importance of group- and self-perceptions in understanding underage drinking. Simultaneous examination of the two types of perceptions in future work may allow for consideration of how both desiring to increase social belonging and perceiving higher levels of alcohol use among higher status peers contribute to adolescent alcohol use.

Second, this study took a broad approach to assessing adolescents' social belonging and adjustment. Inherent in assessing adolescents' peer-related social stress is the need to consider current and desired levels of social belonging within niches of the peer context that are identified as important to the adolescent. Traditional approaches to measuring adolescents' general peer acceptance or rejection (i.e., like or dislike by peers; Newcomb et al., 1993) – or even more recent approaches of measuring perceived popularity (La Fontana & Cillessen, 2002; Parkhurst & Hopmeyer, 1998) – were anticipated to be too simplistic to capture the complexity of adolescents' satisfaction with their current social standings, particularly as adolescent peer crowds continue to become more diverse with development (Kinney, 1993). It was expected that adolescents would vary in the value they placed on belonging to different peer crowds or broader peer networks. Indeed, adolescents in this study varied substantially in which peer crowds they chose as most desired and important

for their social belonging (i.e., from among popular, jock, burnout, brain, or other crowds identified by the adolescents, or general fitting in at school). Therefore, having asked all adolescents to consider their social belonging with respect to a single social reference (e.g., popularity) would have likely led to the inaccurate assessment of some adolescents' peer-related social stress regarding peer crowds less meaningful to them. This broader approach may prove useful in future research when assessing other aspects of adolescent social cognitive perceptions of their social affiliations and belonging.

The Moderating Role of Global Self-Esteem

Examining the peer-related social stress and alcohol use link within the larger context of other aspects of adolescents' emotional adjustment in this study helped to clarify the types of adolescents for whom peer-related social stress may be most influential. Of the additional constructs examined, adolescents' self-esteem in particular contributed to a better understanding of the relationship between peer-related social stress and alcohol use. Self-esteem by itself was not related to alcohol use, meaning that neither high nor low self-esteem was an informative indicator of whether adolescents were prone to drinking. However, previous research has not often pointed to self-esteem as an isolated contributor to adolescent risk behavior, but has instead considered it in combination with other life circumstances. For example, findings that lower self-esteem *and* susceptibility to peer pressure contributed to adolescent alcohol use (Zimmerman et al., 1997) were the impetus for expecting a similar pattern in this study (i.e., that adolescents reporting higher levels of peer-

related social stress would be more likely to drink if they also had lower self-esteem). While adolescents' global self-esteem moderated the peer-related social stress and alcohol use relation in this study, it affected this relationship in an unexpected way.

Rather than lower self-esteem putting adolescents at additional risk for underage drinking, it was adolescents with *higher* self-esteem who were more likely to consume alcohol when also faced with peer-related social stress. This finding raises questions about whether the construct termed 'peer-related social stress' accurately represents a form of 'stress' for all adolescents, and if not, whether the self-perception of less peer crowd affiliation than desired can be more accurately represented using other terminology. Stress is traditionally most basically considered to describe negative psychological adjustment to negative life experiences. Of note, the construct of peer-related social stress in the present study was significantly negatively correlated with global self-esteem overall. Similarly, peer-related social stress was significantly positively correlated with involuntary engagement stress responses (i.e., rumination, intrusive thoughts, physiological arousal, emotional arousal, and impulsivity), experiences thought to involuntarily co-occur with stress when it is not well-managed. Furthermore, peer-related social stress was found in this study sample to significantly positively correlate with measures of internalizing problems that typically relate to poor coping with stressful experiences (i.e., r with depressive symptoms = .18, $p < .05$; r with social anxiety = .17, $p < .05$; r with separation anxiety and panic = .28, $p < .001$). Moreover, peer-related social stress does relate to a variety of traditional indicators of exposure to stress when considering

the study sample as a whole. However, the finding involving examination of self-esteem as a moderator suggest that a subset of adolescents who experienced peer-related social stress but endorsed higher self-esteem were more likely to engage in drinking than adolescents endorsing lower self-esteem.

There are several possible explanations for this finding. First, it may be that adolescents with higher self-esteem do perceive less than desired peer crowd affiliation as similarly stressful compared to their peers with lower self-esteem. However, they might maintain a stronger sense of self-efficacy that motivates them and gives them more confidence in their ability to change undesired social situations. This subset of adolescents may recognize alcohol use as a means of improving their social belonging, which would in turn decrease their peer-related social stress. Indeed, higher self-esteem in this study was positively correlated with the dimensions of coping that incorporate active striving for solutions to problems (i.e., primary and secondary control engagement coping).

Alternatively, the high self-esteem characteristic of those adolescents who drank when experiencing peer-related social stress may be indicative that this subset of adolescents also experience other aspects of positive psychological adjustment and do not experience the desire for increased peer crowd affiliation as a source of stress. The discrepancy between desired and perceived actual belonging may instead more neutrally represent social goals about affiliation (Jarvinen & Nicholls, 1996; Ryan & Shim 2006), meaning that perhaps this subset of adolescents recognizes alcohol as a social lubricant of use in helping them to attain their goal of increased affiliation.

Adolescents who are less well-adjusted (e.g., poorer social skills, more social anxiety, lower self-esteem) may be less likely to view alcohol as important for reaching the social goal of increased affiliation, particularly because the social nature of alcohol use among adolescents seems to most often require skilled access to a social network.

If high self-esteem is an indicator of positive social and emotional adjustment, then perhaps these adolescents share other indicators of adjustment and success. After all, adolescents who engage in some experimentation with substances have been found to be more socially skilled and connected compared to abstainers (Shedler & Block, 1990), meaning that experimenters may also experience success in other related areas (e.g., academic achievement or extracurricular leadership). These speculations can only be tested with further research involving more in-depth examination of the functioning among adolescents who desire increased peer crowd affiliation *and* engage in underage drinking. It would also be important to consider adolescents' actual social standing as reported by their peers, because it may be that this subset of adolescents is actually viewed as higher up the social hierarchy but just personally dissatisfied about their social belonging. Moreover, long-term longitudinal designs are necessary for categorizing adolescents experiencing peer-related social stress at the high school transition as abstainers, experimenters, or frequent consumers of alcohol over time during high school.

Alcohol Expectancies: Drinking for Sociability More Than Tension Reduction

The investigation of adolescents' sociability and tension reduction positive alcohol expectancies as additional risk factors for alcohol use in this study shed

further light on the contexts within which mainstream adolescents drink. While both types of positive expectancies were independently related to alcohol use in preliminary analyses, only sociability alcohol expectancies emerged as significantly related to alcohol use in the comprehensive model of risk factors. This distinction replicates previous findings that sociability expectancies seem to be relatively more important for predicting alcohol use among adolescents (Fromme & D'Amico, 2000). Tension reduction expectancies were expected to be of some importance in the present study due to the anticipated stressful nature of peer-related social stress among some adolescents (i.e., some adolescents were expected to drink to reduce their tension in addition to improve their sociability). However, there are both theoretical and methodological reasons why this may not have been the case.

In light of the discussion above about high self-esteem and alcohol use, it may be that adolescents who reported alcohol use in this sample either were not experiencing high levels of tension or stress, or viewed the increased sociability alcohol affords them as an appropriate solution for reducing their peer-related social stress. Furthermore, given the social nature of alcohol use among adolescents in general, drinking to reduce tension may emerge only among less mainstream adolescents or more typically among adults who have easier access to alcohol outside of social networks and subsequently utilize it as a coping mechanism. Alternatively, given that sociability and tension reduction alcohol expectancies were highly correlated in the present study (as they often are; Fromme et al., 1993), it may be that their shared variance led sociability expectancies to emerge as more important when

the construct was instead merely carrying the shared variance of both types of expectancies. Modeling each of the types of positive alcohol expectancies within a higher order construct of positive alcohol expectancies may provide a clearer understanding of the relative importance of these types of expectancies in the presence of peer-related social stress among adolescents.

Coping and Involuntary Stress Responses

Among the coping styles and involuntary stress responses examined in association with alcohol use, involuntary engagement was the only construct that emerged as related to alcohol use in preliminary analyses, although it was no longer predictive of alcohol use in the context of the comprehensive model in this study. Of most interest were the unexpected null findings suggesting that sociability and tension reduction alcohol expectancies did not operate as moderators of the coping and alcohol use links. In accordance with maladaptive coping theory (Spears, 2000), primary control engagement coping was anticipated to be more related to alcohol use among adolescents endorsing sociability alcohol expectancies, which would have supported the notion that primary control engagement coping is important to consider with respect to alcohol use when sociability expectancies prompt active alleviation of a social stressor (e.g., desiring more social belonging) through drinking. Instead, sociability positive alcohol expectancies were highly predictive of alcohol use across the sample regardless of coping tendencies. In retrospect, this is not surprising given the wealth of previous work demonstrating the importance of sociability expectancies for understanding alcohol use (Fromme & D'Amico, 2000), regardless of the

presence of an identifiable stressor or related coping. Moreover, the current findings may not necessarily contradict maladaptive coping theory (Spears, 2000) but rather indicate that coping strategies do not have to be directly measured to assume that adolescents engage in risk behavior to improve their social status.

The expected role of tension reduction alcohol expectancies as a moderator or the disengagement coping and alcohol use link was also not supported in this study. There are at least two possible reasons why this was the case. First, this hypothesis was made under the assumption that some adolescents would be experiencing a significant stressor that would elicit tension and some type of related coping response. As discussed previously, it is unclear in this study whether all adolescents were actually experiencing stress related to not feeling satisfied with their level of social belonging. If they were not, this pathway would not likely result in alcohol use. Second, even if adolescents were expressing tension related to peer-related social stress, the source of stress was different than that conceptualized in previous studies examining the stress-vulnerability hypothesis (Cooper et al., 1992; Laurent et al. 1997). In these studies, adults and adolescents were found to maintain tension reduction expectancies and engage in emotion-focused coping when faced with negative life events, not necessarily the type of social stressors measured in this study. Furthermore, the approach to measuring coping in these studies differed from the approach in the present study. Disengagement coping (measured in the present study as denial, avoidance, and wishful thinking; Connor-Smith et al., 2000) was knowingly not the same construct as emotion-focused coping, which was used in the

previous studies that have supported the stress-vulnerability hypothesis (Cooper et al., 1992; Laurent et al., 1997).

Limitations and Future Directions

There are several measurement-related limitations and challenges within this study that should be noted. The sole utilization of self-report data in this study, as well as in psychological research in general, often raises questions about the interpretability and reliability of study findings. However, adolescents' self-reports were used in this study for reasons that arguably do not compromise the value of the results. Many of the constructs central to the study research questions are cognitive in nature and can only be accurately measured by asking adolescents themselves. For example, adolescents' self-esteem, perceptions of their own peer crowd belonging, expectancies of how alcohol use will affect them, and coping strategies used in social situations are constructs that are most meaningfully measured when adolescents report from their own perspectives. Additionally, alcohol use is also often most practically measured via self-report, given the legal limitations of utilizing observational methods or asking others to report illegal behavior among specific adolescents. In addition to potential limitations with self-report data, it should also be noted that the order of self-report measures presented to participants was not counterbalanced across the sample.

The benefits of self-report data aside, there are several ways that utilizing other reporters in future research may contribute to understanding of adolescent alcohol use within the context of the other variables in this study. Peer group reports

of adolescents' peer crowd affiliations would provide some validity and an additional perspective on adolescents' own perceptions of their peer crowd belonging. Teacher, parent, or peer reports may also be useful for gaining a more detailed picture of the social, psychological, and academic adjustment of adolescents who engaged in alcohol use within the various parameters considered in this study.

As is common when developing and piloting new measures, there were several additional challenges in the present study regarding the most appropriate use and interpretation of the data generated from the measure of peer-related social stress. The difference score methodology used to create the peer-related stress variable has been criticized, though particularly when it has been used to capture longitudinal change or reporter discrepancies (Cohen, Cohen, West, & Aiken, 2003). Difference scores are thought to adequately capture psychological constructs, such as peer-related stress, by representing concurrent differences between two different variables (e.g., see the expectancy-value or affect balance literatures for other examples). Of note, even though difference scores can inherently yield less power due to measurement error and unreliability, examination of discrepancy in this study using both difference scores and residual change scores yielded the same result, that peer-related stress predicted alcohol use. Additionally, use of the difference scores as indicators of the latent construct of peer-related stress in SEM procedures yielded a stronger relation to alcohol use due to the removal of measurement error and unreliability that is characteristic of SEM. Future refinement of the measurement of the peer-related stress construct may further minimize measurement error and identify

alternative means of more purely assessing the actual-desired belonging discrepancy.

Gathering adolescents' perceptions of and satisfaction with their belonging across a variety of peer crowds proved to be necessary for best capturing such perceptions about crowds that were most meaningful and important to each adolescent. However, it was additionally difficult to determine the best approach for integrating adolescents' scores across those crowds that were important for each of them. Considering the scores for the two most desired peer crowds, as was done in this study, offered a summary of desired belonging for the most important crowds, although there were many adolescents who considered more than two crowds to be important. Future work may be able to build upon the approach taken here for considering more than two crowds by developing methods for incorporating differing numbers of scores across the participants in the sample (e.g., using a weighting factor based on the ordering of desired peer crowds or an analytic approach that allows for unbalanced indicators across participants).

In addition to challenges with scoring the peer-related social stress measure, there were several issues raised in interpreting the results of this study that could be addressed in future research. First, the question of whether desires of increased social belonging in targeted peer crowds are stressful for all adolescents is important for further understanding how the construct operates in relation to alcohol use. Second, additional questions remain about the overall picture and adjustment of the subset of adolescents in this study who reported high self-esteem, peer-related social stress, and alcohol use. Investigating whether these adolescents embody characteristics of

positive adjustment (e.g., academic achievement and engagement, extracurricular involvement) would help determine the degree to which they are socially well-adjusted and successful.

An additional measurement limitation was related to the lack of consensus in measuring coping styles throughout the literature. The Responses to Stress Questionnaire (RSQ; Connor-Smith et al., 2000) was chosen to assess coping in this study because of its benefit of asking adolescents to report on their coping with specific social stressors, as well as its validation among multiple adolescent samples. However, previous literature that supported the hypotheses pertaining to coping in this study conceptualized coping styles differently than the RSQ (i.e., problem-focused, emotion-focused, and avoidant coping; Cooper et al., 1992; Laurent et al., 1997; rather than the engagement and disengagement distinction on the RSQ; Connor-Smith et al., 2000). Future work pertaining to peer-related social stress and alcohol use may do well to consider other conceptualizations of coping to determine whether coping mechanisms remain unrelated to adolescent alcohol use.

Several final disclaimers are notable for appropriately placing the study findings in the context of the body of research on adolescent alcohol use. In terms of generalizability, the lower percentage of participating adolescents (i.e., 45% of adolescents in the grade within which parents were contacted) may raise questions about how representative the findings are of the larger school population and adolescents in general. The known reasons for why parents did not provide consent (i.e., lack of follow through in returning consent forms, few cases of preferring

adolescents not to participate) or adolescents with consent chose not to participate on data collection days (i.e., conflicting extracurricular or academic responsibility, using study hall pass to skip class period and leave school building, and unawareness that parents' provided consent and not personally wanting to participate) did not appear systematic enough to suggest any definitive problems with generalizability. Fortunately, the gender and ethnic breakdown of the sample indicated that participating adolescents represented the demographics of the larger school population, and the percentage of adolescents engaging in drinking in the sample was not different from national averages. The measurement of socioeconomic status (i.e., adolescent reports parents' education levels) was a limitation to determining the representativeness of the sample in terms of economic diversity.

Finally, a few points regarding references to the present study as comprehensive and situated at a school transition are warranted. While this study is *more* comprehensive than many previous studies examining similar constructs, it is by no means *completely* comprehensive in terms of simultaneously investigating the interrelationships among all constructs known to significantly contribute to alcohol use among mainstream adolescents (e.g., family or parenting variables). However, as individual studies work towards uncovering important constructs for better understanding alcohol use among mainstream and successful adolescents, the goal would be to develop and test increasingly comprehensive models. Additionally, the present study suggested that adolescents' perceptions of their peer crowd belonging may be particularly salient and stressful as they adjust to a new school and broader

peer network following the high school transition. Given that the study was not longitudinal in nature, future work able to appropriately capture the high school transition by gathering data both before *and* after the school change will better speak to the role of the transition in affecting the onset and increases in alcohol use. Longitudinal work extending further into high school would also be able to examine how changes in peer-related social stress affect changes in alcohol use over time, as well as how adolescent milestones (e.g., acquiring a driver's license) contribute to the social processes highlighted in this study.

Conclusions and Implications for Prevention and Intervention

This study provided support for the simultaneous influence of several indicators of social cognitive and emotional adjustment on adolescent alcohol use among a mainstream, school-based sample of adolescents following the high school transition. Adolescents' peer-related social stress was found to be an important predictor in the comprehensive model. This finding is consistent with the longstanding acknowledgement that peer influence is central to typical adolescent life and adjustment (Urberg et al., 1997) and represents a previously less recognized and more indirect aspect of peer influence. Specifically, this study revealed that adolescents who desire higher social status and more social belonging within peer crowds within which they strongly value affiliation are more likely to report alcohol use. Additionally, adolescents with higher self-esteem were found to be particularly likely to engage in underage drinking when experiencing peer-related social stress. Furthermore, adolescents' expectancies that alcohol use would increase their

sociability were additionally related to alcohol use in the comprehensive model. In summary, adolescents with relatively high self-esteem who were experiencing peer-related social stress and believed that alcohol would improve their sociability were the most likely to engage in underage drinking. Given that this set of characteristics are likely common among adolescents adjusting to high school, the model supported in this study informs several aspects of adolescent adjustment likely to contribute to multi-faceted models of risk factors for underage drinking among "mainstream and successful" adolescents (Psychosocial Processes, 2004/2005).

In addition to contributing to the ongoing goal of better understanding what drives alcohol use among typically developing adolescents, the results have several implications for prevention and intervention efforts. Among clinical and antisocial populations of adolescents, substance use is often more easily recognized as one aspect of adolescents' maladjustment and one aim of intervention approaches. However, among the many typically developing adolescents who use alcohol in their regular social activities, there may be no clear indicators that adolescents are engaging in high levels of alcohol use. Therefore, the influences on alcohol use identified in this study are likely most important for incorporating into widespread school- or community-based prevention efforts, compared to targeted interventions. Given that interactive prevention programs focusing on interpersonal skills have been found to be more effective than those that are less interactive and focused on knowledge about substances (Tobler et al., 2000), the findings of this study may most appropriately contribute to improving the peer networking and cognitive-behavioral

components of interactive programs by giving attention to the complex social purposes that many adolescents believe drinking can serve. Normalizing perceptions that using alcohol can be a means to gaining social acceptance and status, correcting false impressions about the degree to which socially successful adolescents within specific peer crowds engage in drinking, and providing healthy alternatives to reaching desired levels of social belonging may be important additions to prevention efforts given the findings in this study.

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Table 10

Means, Standard Deviations, and Correlations Between the Manifest Variables by Gender

	Peer Stress	Self-Esteem	Coping			Involuntary Stress Responses		Alcohol Expectancies		Alcohol Use
	1	2	3	4	5	6	7	8	9	10
M	14.28	3.35	2.36	2.48	2.00	1.94	1.70	2.94	2.60	-.04
SD	15.08	.57	.56	.50	.44	.63	.48	.80	.86	.86
1. Peer-Related Social Stress	--	-.19	.00	.13	.33**	.24*	.27*	.13	.02	.24*
2. Global Self-Esteem	-.16	--	.20	.26*	-.29**	-.40***	-.46***	.15	.24*	-.08
3. Primary Engagement Coping	-.10	.33**	--	.44***	.17	.38***	.19	.23*	.15	.07
4. Secondary Engagement Coping	-.02	.27*	.53***	--	.27*	.12	.03	.06	.16	-.08
5. Disengagement Coping	.01	-.40**	-.00	.09	--	.49***	.63***	.10	-.03	.09
6. Involuntary Engagement	.08	-.37**	.22	.23	.67***	--	.83***	-.04	-.19	.11
7. Involuntary Disengagement	.06	-.37**	.01	.21	.70***	.79***	--	-.10	-.18	.12
8. Sociability Expectancies	.16	.03	.07	.14	.03	.11	.04	--	.61***	.41***
9. Tension Reduction Expectancies	.17	-.18	-.37**	-.13	.06	.05	.28*	.44***	--	.34**
10. Alcohol Use	.31**	-.21	-.13	-.14	.09	.28*	.16	.28*	.27*	--
M	15.46	3.30	2.73	2.58	2.08	2.01	1.77	3.17	2.46	. 05
SD	17.65	.68	.62	.55	.54	.66	.58	.73	.86	.88

Note. Statistics above the diagonal are for boys (n = 88); below the diagonal for girls (n = 72). The Alcohol Use items were standardized to put them on the same metric prior to creating the aggregate variable. * $p < .05$. ** $p < .01$. *** $p < .001$.